ELECTRICAL TIMES

THURSDAY
16 AUG.
1951
NINEPENCE

A New
Type L
CLIP-ON
AMMETER

Specially designed for use with porcelain clad fuses and heavy duty conductors up to 4" diameter.

Fully insulated core

7 RANGES

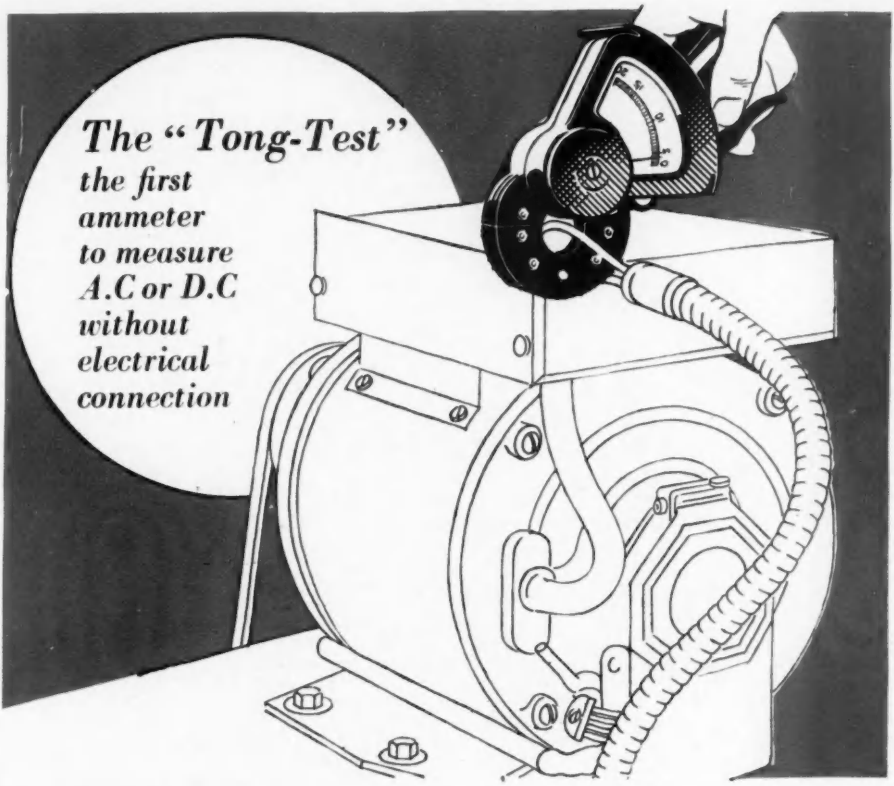
0 — 10
0 — 25
0 — 50
0 — 100
0 — 250
0 — 500
0 — 1000

Amperes A.C.

FERRANTI

FERRANTI LTD. HOLLINWOOD LANCS.
LONDON OFFICE KERN HOUSE KINGSWAY W.C.2.

FI80a



The right answer by Crompton Parkinson Instruments FOR INDUSTRIAL AND EDUCATIONAL PURPOSES

ELECTRICAL EQUIPMENT

Crompton Parkinson LIMITED

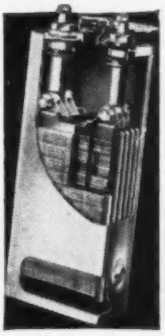
CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2

Telephone: Chancery 3333 *Telegrams: Crompark, Estrand, London*

N.I.

COSTS LESS TO MAINTAIN

For switchgear operation, Nife batteries are the wisest choice because they cost practically nothing to maintain. Being made principally of steel, and with an electrolyte that is steel-preserving, they are almost indestructible. The heaviest rates of charge and discharge cannot hurt Nife batteries—they show almost instantaneous recovery of voltage when the load is switched off. For all these reasons, and because Nife batteries take up very little space, many power stations rely entirely on Nife for all switchgear operation.



N.B. Nife batteries are not yet available for private cars or domestic radio.

CUT YOUR COSTS WITH NIFE STEEL BATTERIES

NIFE BATTERIES · REDDITCH · WORCESTERSHIRE

A

There's only one answer

OF COURSE IT'S

A

PERMAHEAT

ELECTRIC BLANKET.

From RETAILERS, STORES, BOOTS THE CHEMISTS etc. etc.

PERMAHEAT LTD. SPECTATOR STREET, MANCHESTER, 4

ANNOUNCING

MODEL NO. N.1600

for SPEED INFORMATION and 3-WAY PROTECTION of CASH RECEIVED

A FOUR TOTAL RECEIPTING MACHINE

Providing 3 identical, non-carbon printed records of receipts on

1. The Customer's Account
2. The Receipt Posting Stub
3. The Locked-in Audit Record

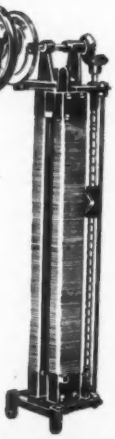
National

ALL TOTALS UNDER LOCK & KEY

For details and demonstrations please write or phone
THE NATIONAL CASH REGISTER COMPANY LTD.
206 Marylebone Rd., London, N.W.1. Paddington 7070

SLIDING RESISTANCES

for all purposes



At a price you will approve, CRESSALL can supply you with a Sliding Resistance of the type and size to meet your particular requirements. Make a point of getting in touch with us soon.

CRESSALL

registered Trade Name of –
The CRESSALL MANUFACTURING CO., LTD.,
Tower Street, Birmingham 19.
Telephone: ASTon Cross 2666 (3 lines)
Telegrams: OHMIC, BIRMINGHAM

FOR LOCALISED LIGHTING YOU CANNOT AFFORD TO IGNORE THE ADVANTAGES OF **LOW VOLTAGE**

★ *For* **HAND INSPECTION LAMPS ON OVERHEAD TRAVELLING CRANES** it is specified by B.S.S. 466 (1947).

★ *For* **LAUNDRIES, DYE WORKS, GARAGES** and other locations where wet conditions exist it is a "must."

★ *For* **MACHINE TOOLS** it has long been accepted standard practice.

IGRANIC "LO-VO-LITE"

Transformer - Switch - Fuse Units and Lighting Fittings are fully described in Publication 68610Z1.

Available on request to Publicity Dept., Bedford.

ELECTRIC IGRANIC CO. LTD.

HEAD OFFICE & WORKS: BEDFORD

EXPORT DEPT.: VICTORIA STATION HOUSE
191 VICTORIA ST., S.W.1

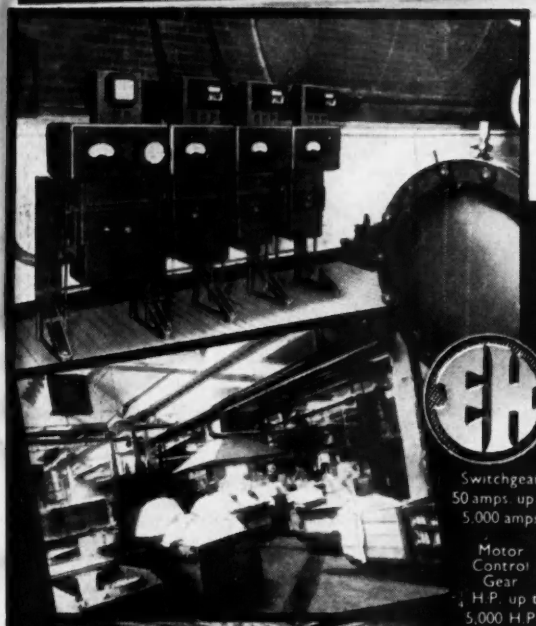
DISTRICT OFFICES:

LONDON · BIRMINGHAM · BRISTOL · CARDIFF · GLASGOW
LEEDS · MANCHESTER · NEWCASTLE · SHEFFIELD

"Erskine Heap" INSTALLATION

at a PROGRESSIVE LANCASHIRE LAUNDRY

On the left can be seen the commencement of the alternating current switchboard and below, part of the old direct current switchboard with the old steam engine which used to provide all the power. Alternating current and up-to-date machinery is superseding the older methods.



Switchgear 50 amps. up to 5,000 amps.

Motor Control Gear ¼ H.P. up to 5,000 H.P.

The two views on the left show interior views of small sections of this Laundry... which is one of the largest in the north of England.

We have supplied Switchgear & Motor Control Gear to many of the most up-to-date Laundries throughout the country.

"It's the Gear Engineers like to 'Live' with."

ERSKINE, HEAP & Co Ltd

SWITCHGEAR SPECIALISTS

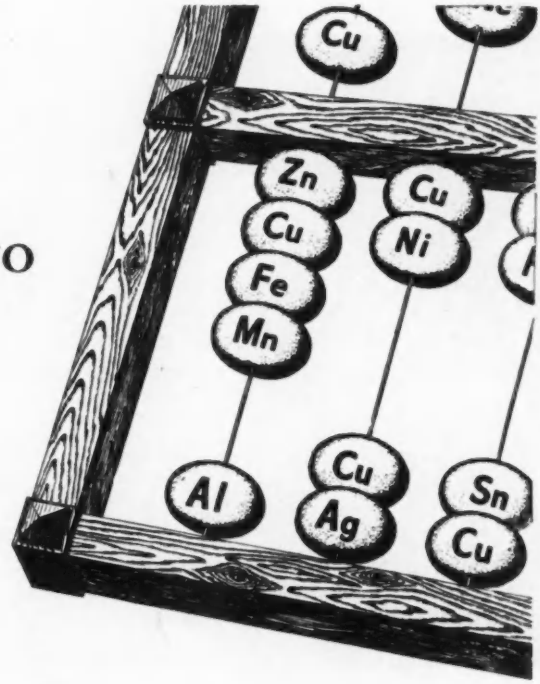
Head Office and Works: BROUGHTON, MANCHESTER (7)

London Office: GRAND BUILDINGS, TRAFALGAR SQ., W.C.2

BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD

8/51

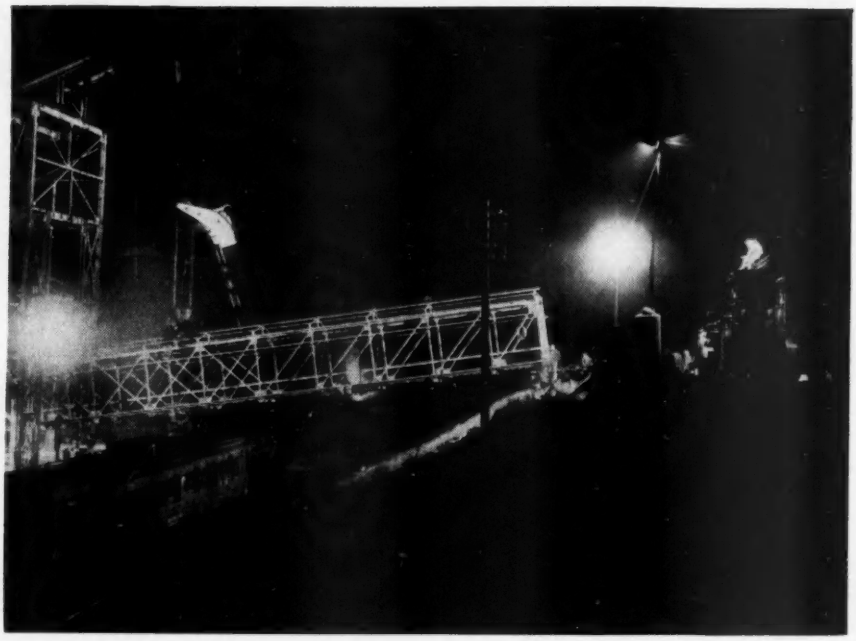
Putting two and two together with COPPER



So successfully have metallurgists put two and two together that copper and its alloys have become indispensable materials in almost every branch of industry. Putting two and two together in a different sense is also the task of the Copper Development Association. By appraising the results of experience and research and advising on their practical application in industry, the C.D.A. helps to ensure the most efficient and economical use of the metal and its alloys. Backed by the full resources of the British copper industry, the Association is a non-trading organisation from which you can obtain, without charge or obligation, full advice on what copper and its alloys can or cannot do.

COPPER DEVELOPMENT ASSOCIATION

KENDALS HALL, RADLETT, HERTS. PHONE RADLETT 5616



Consulting Engineers: Messrs. Kennedy and Donkin

SPANNING THE GAP!

Power-station engineering by Simon-Carves is helping to bridge the gap between the demand for power and the available supply. The actual gap-bridging operation shown above is the lifting into place of a span of a coal conveyor gantry across a railway and roadway at the British Electricity Authority's new Huncoat power station at Accrington; the job was completed in 2¼ hours between darkness and dawn on a Saturday night. At this station Simon-Carves are installing three boiler units, coal and ash handling plant, and electrostatic dust precipitators: they are also responsible for the structural steelwork of the boiler house and a considerable amount of civil engineering work.

Steam power by Simon-Carves Ltd SIMON CARVES GROUP

STOCKPORT ENGLAND

S.C. 31

Standard
Capacitors for
POWER FACTOR CORRECTION

60 kVAr Power Factor Correction Capacitor (comprising 2 units, stanchion mounted).

50 kVAr Capacitor with Contactor (part of an automatically-controlled Power Factor Correction installation).

The new range of ***Standard*** Power Factor Correction Capacitors represents a significant advance in design. Increased cooling surface/kVA ratio results in great reliability in service. Flexibility of layout reduces floor-area required for installation and facilitates mounting on walls or stanchions.

Well adapted to automatic control, ***Standard*** Power Factor Correction Capacitors are simple in operation and low in first cost.

To those considering the power factor correction of electrical plant the advice of ***Standard*** engineers is available. Without charge, without obligation and without delay a visit can be arranged, load conditions investigated, and an estimate prepared.

Please apply to :

Standard Telephones and Cables Limited

(Registered Office : Connaught House, Aldwych, London, W.C.2)

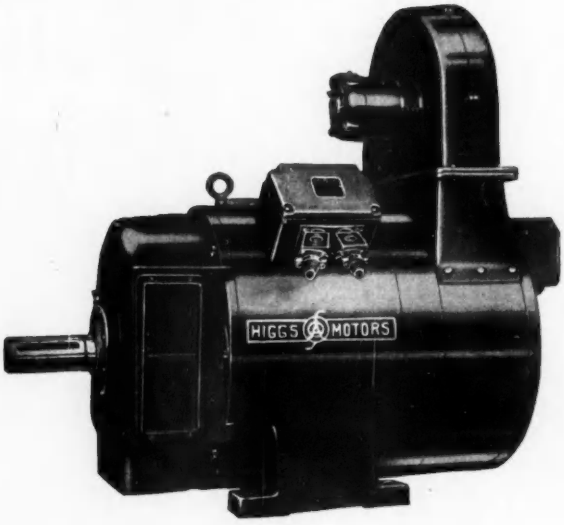
POWER LINE DIVISION (DEPARTMENT 2440)
NORTH WOOLWICH, LONDON, E.16. TELEPHONE : ALBERT DOCK 1401 (EXT. 796)

TRADE MARK

HIGGS MOTORS LTD.

CHAIRMAN WALTER F. HIGGS, M.I.E.E.

BIRMINGHAM 6 ENGLAND



We are one of the very few firms outside the Associated Dynamo & Motor Manufacturers to make electrical machinery above 250 h.p.

GUARANTEED FOR EVER

Belfast, Birmingham, Bristol, Cardiff, Dundee, Glasgow, Leeds, London, Manchester, Newcastle, Peterborough, Sheffield, Wolverhampton

'ENGLISH ELECTRIC'

discharge regulator

Streamline Diffusing Cylindrical Balanced Type

Discharge water from dam outlets possesses considerable energy which, if not regulated, would severely damage the sides of the valley, river bed and concrete structures.

'ENGLISH ELECTRIC' cylindrical balanced discharge regulators destroy this energy by transforming the jet of water into a hollow cone.

The regulator is extremely compact, has simple control gear which can be manually or motor operated, while the balanced closing cylinder ensures that the valve is closed smoothly under all conditions.

'ENGLISH ELECTRIC' discharge regulators have various applications in hydro-electric and irrigation schemes; large numbers are installed and are giving satisfactory service in many parts of the world.

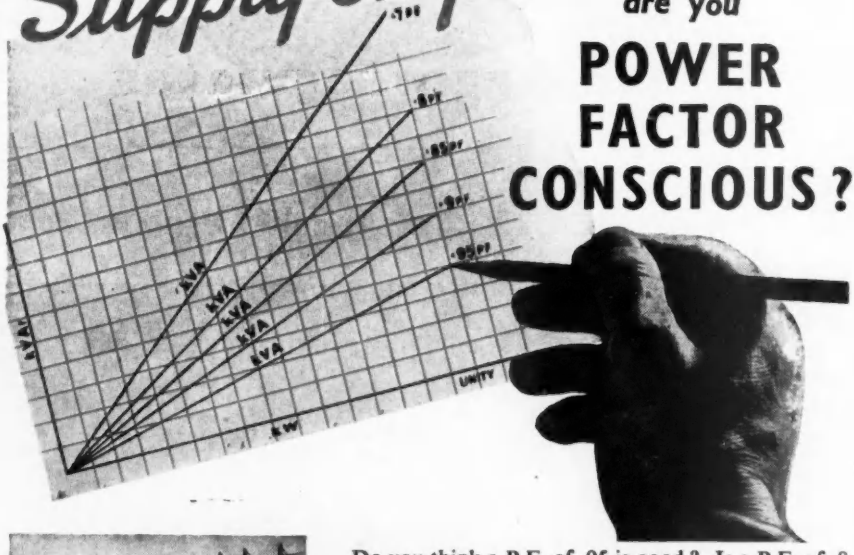
The ENGLISH ELECTRIC Company Limited

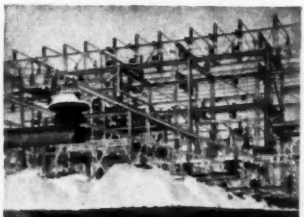
QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

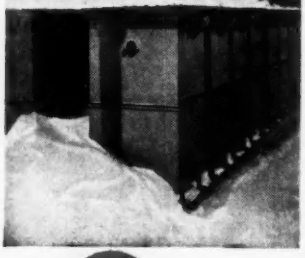
Hydro-Electric Department, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL

Supply Engineers — are you POWER FACTOR CONSCIOUS?







Do you think a P.F. of ·95 is good? Is a P.F. of ·8 tolerable? The idle component of the current is over 30% with the former and 60% with the latter. Neither is really good enough if you wish to deliver maximum power, minimise losses and reduce the voltage drop in your system to the lowest possible figure.

Have you considered using shunt capacitors to improve your power factor?

Today capacitors can be obtained as reliable and durable as the other components of your system . . . if you specify BICC Power Capacitors.

These high quality products are the result of nearly 40 years' research and development and have a guaranteed efficiency of not less than 99·87%. Unlike most other items of electrical apparatus, they require practically no maintenance.

They can be connected as individual units at motor terminals and distribution boards, and in small or large banks at secondary or main sub-stations.

The illustration shows a 20,250 kVAr bank of BICC Capacitors supplied to the Aluminum Company of Canada Ltd. It comprises eighty-one 250 kVAr single-phase units connected for operation at 10·3kV.

Further information is available in Publication 278Q

B.I. Callender's

POWER CAPACITORS

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2

G.E.C.

Post-top Lantern

The G.E.C. Post Top lantern has been specially designed for side road lighting, and is also ideally suited for the illumination of promenades, public gardens, balustrades, forecourts, etc. Amongst its many outstanding features are :—

- Cone shaped body of fluted Perspex with interior dome refractor optical system.
- Bottom gallery of pressed diffusing opal Perspex provides light around base of column.
- Smooth exterior for ease of cleaning.
- Modern design of spigot cap with inset fixing screws.
- Removable top ornament gives easy access to interior for cleaning and lamp renewal.

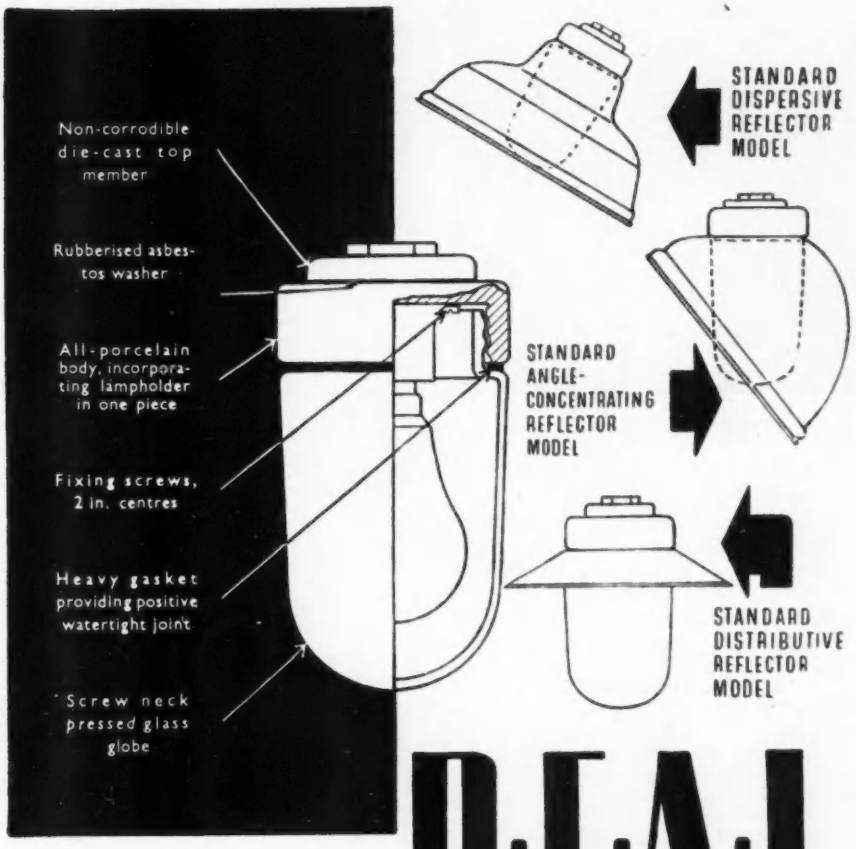
THE GENERAL ELECTRIC CO., LTD.,
MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Aladdin's Genie could not bring you a better seller than the B.N.E. C.49.
With its attractive appearance and outstanding features — aided by national advertising and imaginative sales-aids — it is selling like magic all over the country.

The B.N.E. Model C.49 Electric Cooker

A BNE Product
OF JOHNSON & PHILLIPS LTD

BRITISH NATIONAL ELECTRICS LTD.
THE DOMESTIC APPLIANCES SECTION OF
JOHNSON & PHILLIPS LTD.
NEWARTHILL · MOTHERWELL · SCOTLAND.


Non-corrodible die-cast top member
Rubberised asbestos washer
All-porcelain body, incorporating lampholder in one piece
Fixing screws, 2 in. centres
Heavy gasket providing positive watertight joint
Screw neck pressed glass globe
STANDARD DISPERSIVE REFLECTOR MODEL
STANDARD ANGLE-CONCENTRATING REFLECTOR MODEL
STANDARD DISTRIBUTIVE REFLECTOR MODEL

R·E·A·L

Non Corrodible Watertight Fittings

Send for Leaflet of Complete Range

60 WATT FITTINGS
100 WATT FITTINGS
200 WATT FITTINGS

Issued by ROWLANDS ELECTRICAL ACCESSORIES LTD., R·E·A·L WORKS, BIRMINGHAM, 18

THE NAME IS *Best* FOR QUALITY

This "BEST" COFFEE PERCOLATOR has a 2½-pint capacity, almost instant percolation, a special "keep hot" device and an automatic safety cut-out for the heater. Elegant in design and of superb craftsmanship in heavy gauge copper, it is finished in polished chrome. Loading 500 watts —A.C. only, 100/120, 200/220 and 230/250 volts.

"BEST" ELECTRIC KETTLE

Nominal capacity 3½ pints, the "BEST" Electric Kettle is beautifully made in solid copper with polished nickel or chromium finish (tinned internally). 1250-watt heater with Automatic Safety Connector-Ejector. For 100/120, 200/220, 230/250 volts, A.C./D.C.

"BEST" ELECTRIC JUGS

are useful alternatives to kettles for hot or boiling water supply. Their chromium plated repoussé finish on solid copper graces any table, and special insulated feet protect even the most highly polished surfaces. Capacity: 2 pints (700 watts), or 4 pints (1250 watts); voltages as above.

SPARE "BEST" ELEMENTS

of Non-Automatic and Automatic Safety Connector-Ejector types are of thoroughly reliable construction. Two sizes: 700 watts for 2-pint kettles, and 1250 watts for 3½, 4 or 6-pint kettles. Automatic thermal switch (bimetal) elements are available, also higher loadings if required.

Best Products Ltd.

FELIX WORKS, FELIXSTOWE, SUFFOLK
Phone: Felixstowe 554. Grams: Best, Felixstowe
B12

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rely on **SAX** for **INDICATORS**

Best Quality, Sound Construction, Surface, Flush, Wood or Metal Cased, Mechanical and Electrical Replacement, Luminous; suitable for:—

- HOSPITALS
- INSTITUTIONS
- BANKS & OFFICES
- FACTORIES & WORKS
- FLATS & HOUSES

Diagrams and illustrated catalogue on application.

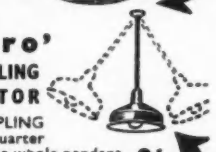
Other **SAX** *Products include:—*
BELLS · TRANSFORMERS
BELL PUSHES
WALL SOCKETS & PLUGS

TRADE MARK

JULIUS SAX & CO. LTD.
24 COMMERCE RD. BRENTFORD.
Telephone EALING 6034-5

LAMP BREAKAGES REDUCED!

A new Best Seller



The Marlboro'
BALL SOCKET COUPLING & ANTI-VIBRATOR

The BALL SOCKET COUPLING (earthed) has a loose quarter spherical sleeve, giving the whole pendant a very easy and smooth action and allowing a greater swinging movement. Retails at **3/-**

• USUAL TRADE TERMS •

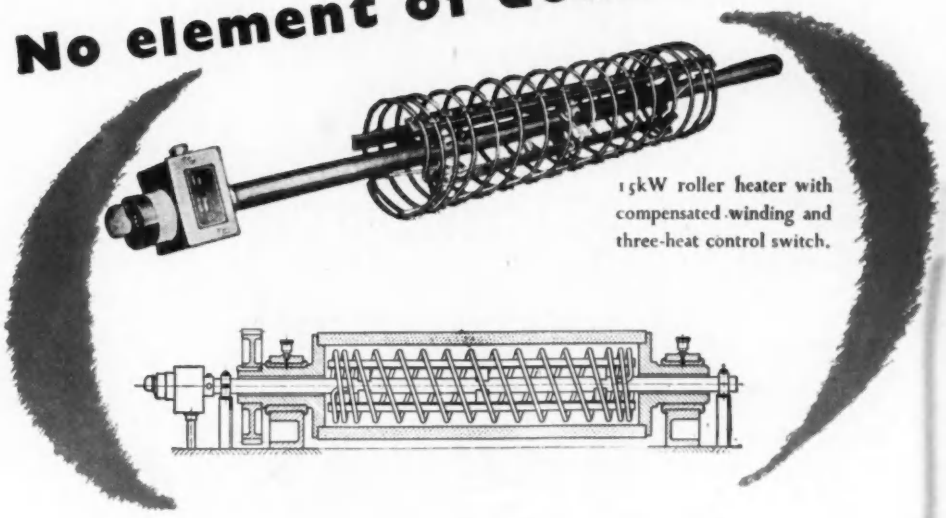
The ANTI-VIBRATOR (earthed); similar to the above, incorporating a special felt pad which effectively damps down the vibrations which would otherwise go direct to the lamp filament. Retails at **3/9**

★ *Send for leaflet.ET* ★ *Samples on request.*

J. E. WILDBORE Ltd. PETER ST. OLDHAM
TEL: MAIn 4475
• 43 YEARS LIGHTING SERVICE •

This is the fourth of a series of six advertisements on Metrovick Industrial Heating Elements

No element of doubt . . .



1·5kW roller heater with compensated winding and three-heat control switch.

. . . with Metrovick Elements

ROLLER HEATING

The Metrovick tubular sheathed heating element can be used very effectively to heat calender rollers by electricity without having to resort to sliprings and brush-gear. The heater is rigidly supported outside the bearings and remains stationary whilst the roller rotates round it.

The diagram shows how a heater of this type can be mounted within a roller.

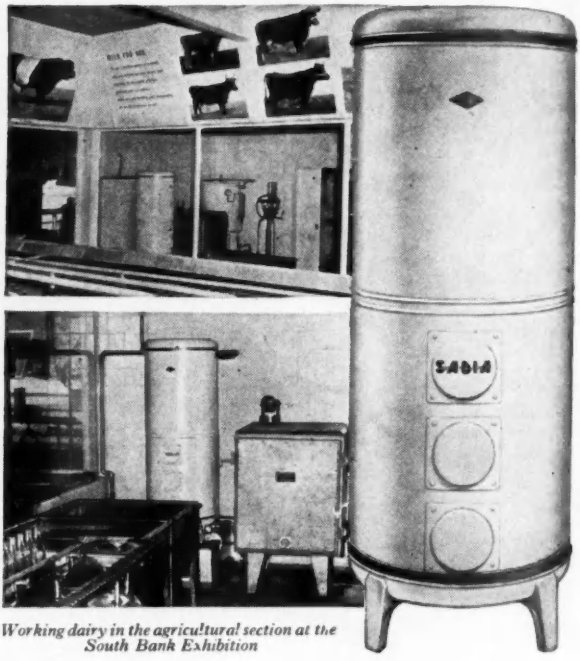
With this form of heater, the element spacing can be varied to assist in obtaining uniform temperature distribution along the working face of the roller.

METROPOLITAN-VICKERS ELECTRICAL CO. LTD., TRAFFORD PARK, MANCHESTER 17

METROVICK

"Redrings" for domestic use.

1,300 gallons of hot water



Working dairy in the agricultural section at the South Bank Exhibition

Sadia behind the scenes at the Festival

THE SADIA 50-gallon electric water heater in the model dairy at the South Bank Exhibition is there for every visitor to see. The unit supplies the hot water needed for washing equipment and utensils.

But, behind the scenes at the Festival, Sadia Water Heaters are making a much more important, although less obvious, contribution. For hot water is also required for cloakroom basins, cleaners' sinks and other services. At both the South Bank and Battersea sites, a large number of Sadia water heaters have been installed. In them over 1,300 gallons of hot water are kept ready for immediate use. Hundreds of thousands of gallons of hot water will be provided over the period of the Festival.

The choice of Sadia water heaters for these important services is no arbitrary one. For over 28 years Aidas Electric Ltd. have specialised in the manufacture of electric water heaters. In this time they have earned an unequalled reputation for quality and reliability. That is why Sadia water heating equipment is so often specified.

SADIA
HOT WATER BY ELECTRICITY

AIDAS ELECTRIC LIMITED

Sadia Works, Rowdell Road, Northolt, Middlesex. Scottish Agents: W. Brown & Co. (Engineers) Ltd., 29, Douglas Street, Glasgow, C.2. Manufactured in South Africa by Sadia Water Heaters (Pty.) Ltd., 3-5, Newton Street, Village Main, Johannesburg.

A new arrival of SUPERIOR DESIGN

The C·B·15

5ft 80 WATT LAMP
SINGLE LAMP UNIT

£5·7·6

Including CONTROL GEAR

Body constructed of aluminium with one piece cast aluminium end covers. Pretreated to provide efficient bonding for two coats of White stove enamel. Centre point fixing.

Full details and Export Prices from:

SMART & BROWN (ENGINEERS) LIMITED

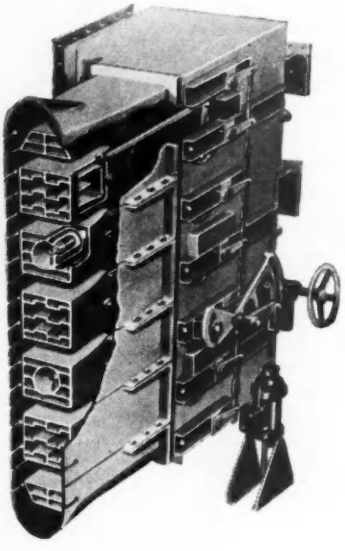
TRADING ESTATE, SPENNYMOOR, CO. DURHAM

PROGRESS...

C.3

The LOPULCO Burner

then and now



The present-day Lopulco long flame burner — the only one designed to provide at will an adjustable furnace — is one of the great achievements of steam engineering. But the Lopulco Burner has always kept ahead of the times, and its design has been radically altered as the science of combustion progressed. The original downshot burner was associated with a refractory-lined chamber having ports for secondary air admission. The present-day horizontally-mounted burner has integral secondary air around tilting nozzles and is combined with a completely water-cooled furnace. By means of the exclusive tilting feature it provides a combustion chamber in which the zone of heat release is adjustable. This gives a variation in outlet gas temperature sufficient to govern superheater steam temperature without any heat-exchanger control.

This is a further example of how ICL maintain their lead in the field of combustion.

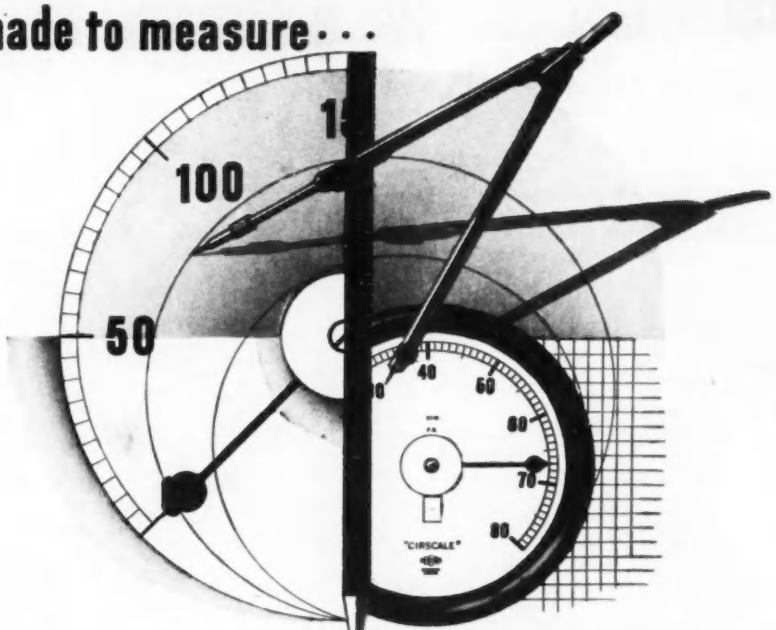
ICL

INTERNATIONAL COMBUSTION LTD

LONDON OFFICE: NINETEEN WOBURN PLACE, W.C.1

Works: DERBY, ENGLAND · PORT ELIZABETH, SOUTH AFRICA · SYDNEY, AUSTRALIA

made to measure . . .



ACCURATELY

The man who knows exactly what his machine is doing—who has accurate, constant and visual indication of its Consumption; its Speed; its Output, etc. is wise.

But, one who uses a "RECORD" Electrical Measuring Instrument is wisest. It is made to measure—ACCURATELY, by those who were the pioneers of the "CIRSCALE" and who have kept ahead.

RECORD

"RECORD" Instruments include:—
Switchboard Instruments, "Cirscale" Switchboard Instruments, Portable Instruments, Insulation and Resistance Test Sets, Cut-Outs, "Circscale" Electric Tachometers, Current Transformers, Chart Recorders, Shirley Moisture Meters, Shirley Static Eliminators.

THE RECORD ELECTRICAL COMPANY LIMITED

BROADHEATH · ALTRINCHAM · CHESHIRE

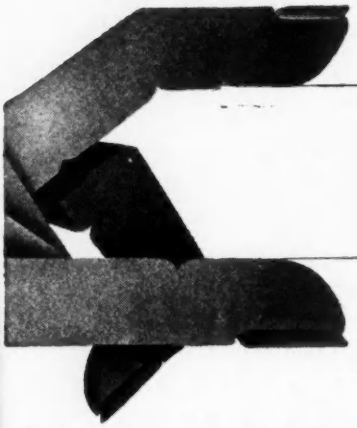
Phone: Altrincham 3221/2/3
London Office: 28 Victoria Street, London S.W.1
Grams: "Cirscale" Sowest, London

Cables and Grams: "Cirscale" Altrincham
Phone: Abbey 5148 and 2783
Cables: "Cirscale" London

COMPLETE CONTROL *with two wires*

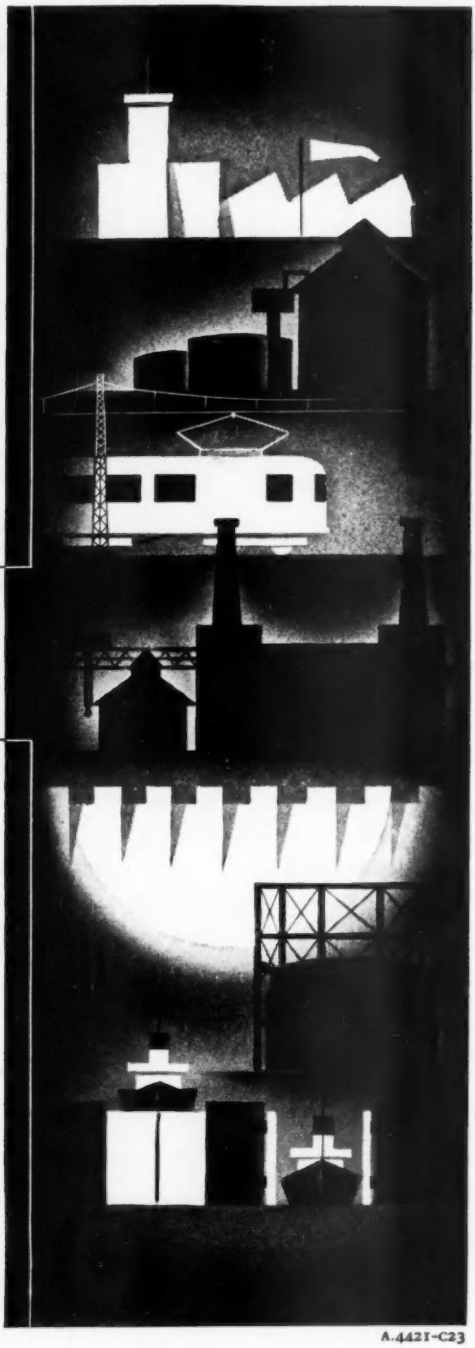
The outstanding success of "A.T.M." supervisory remote indication and control equipment in electrical, gas, petroleum and other undertakings, will lead to its adoption in many other widely diverse spheres.

Using only two wires, which are still available for telephone use, this flexible and versatile system may be used to control a large variety of operations over practically any distance. For example, in electrical undertakings the control engineer has the following facilities (amongst others):—closing and tripping of circuit breakers, starting and stopping of



machines, voltage control through transformer tap change equipment, fault condition warning, and all essential metering.

The possibilities of this equipment for your industry are well worth investigating and "A.T.M." engineers will be happy to collaborate.



Supervisory Remote Indication and Control Equipment

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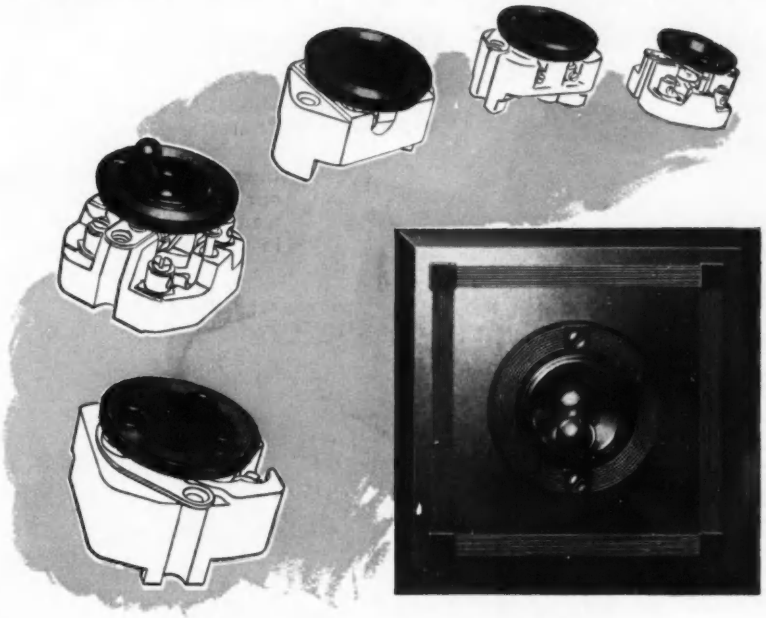

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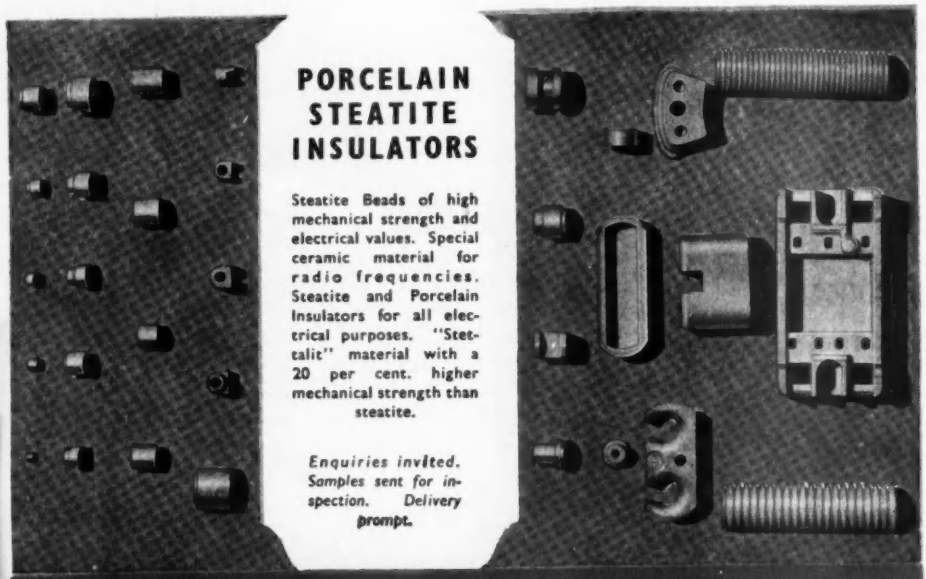

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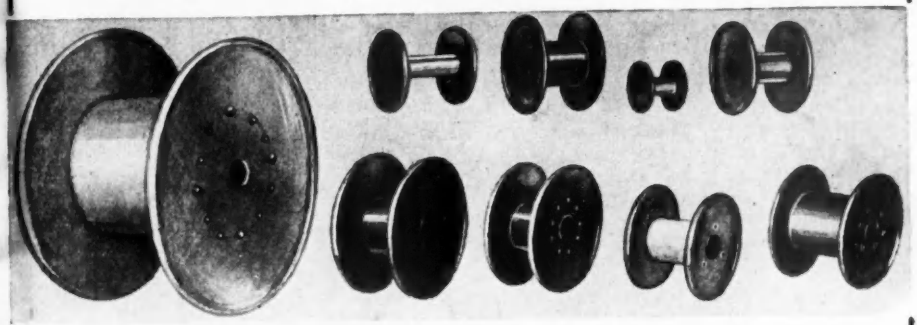

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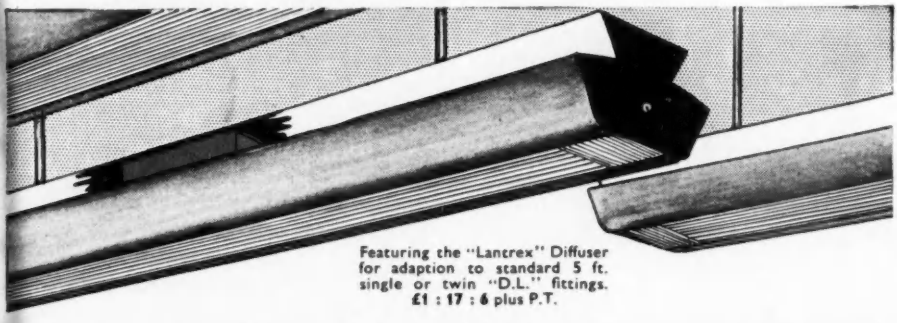

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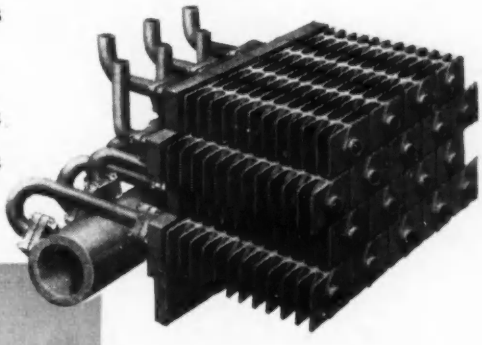

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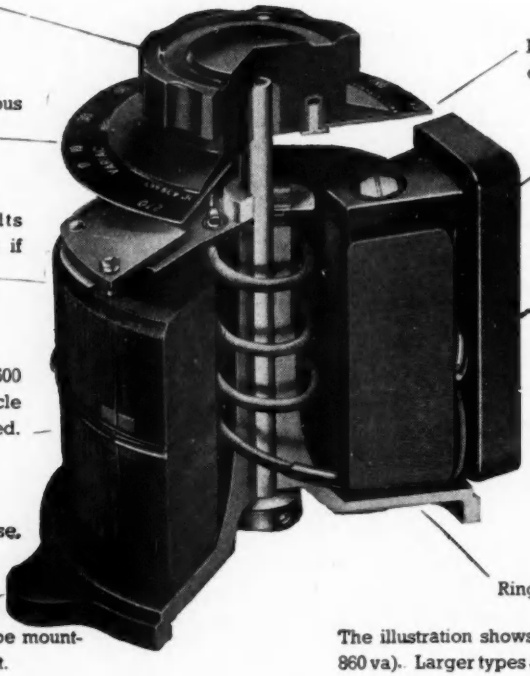

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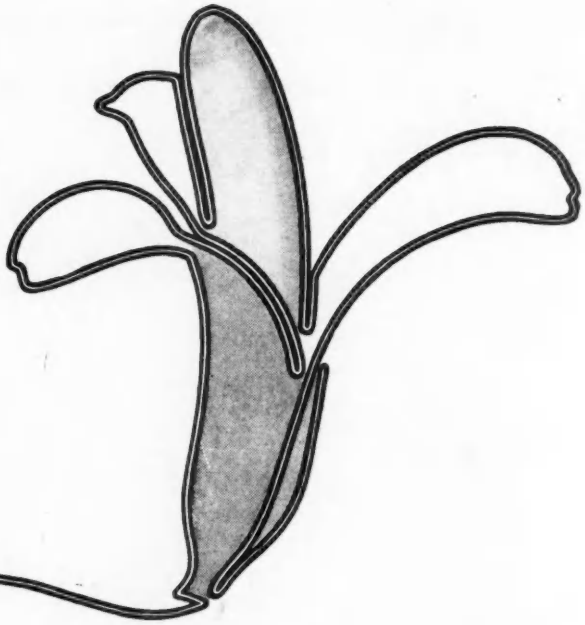

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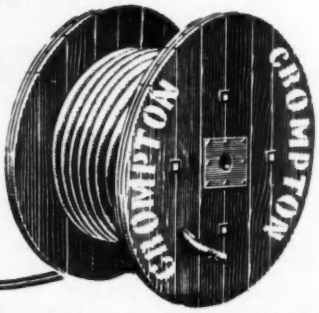

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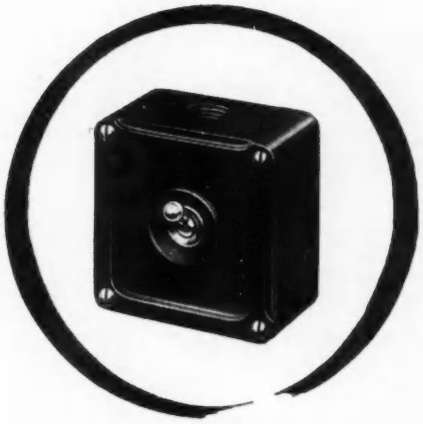

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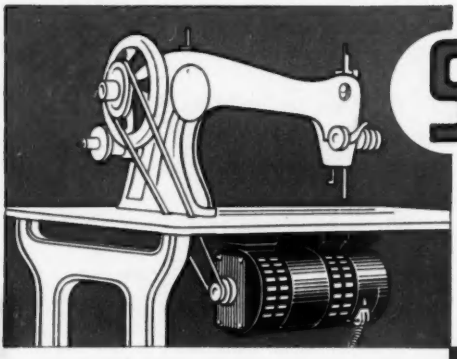

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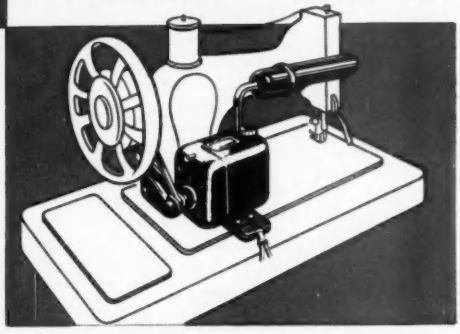

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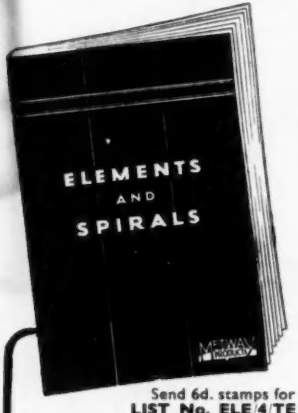

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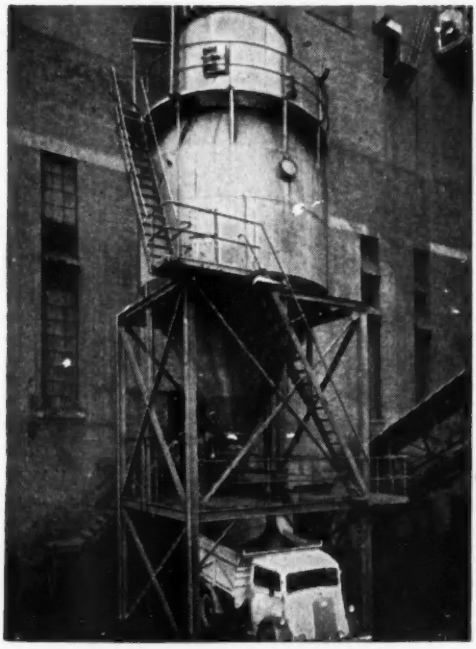

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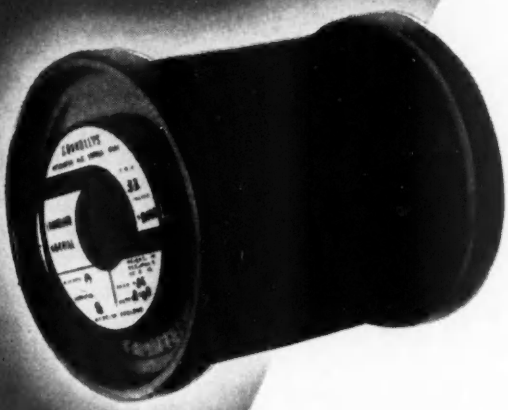

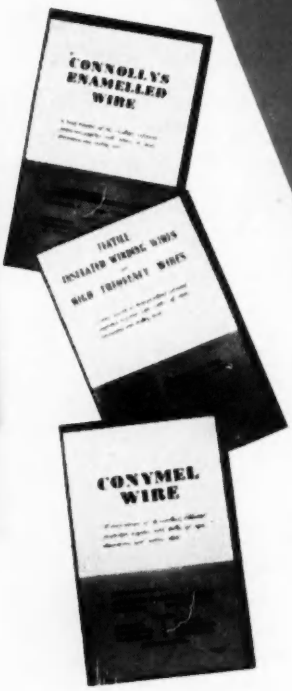

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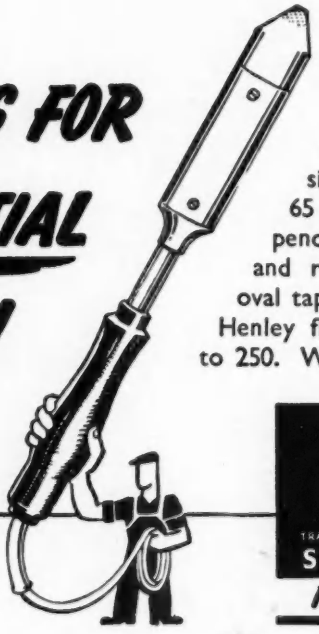

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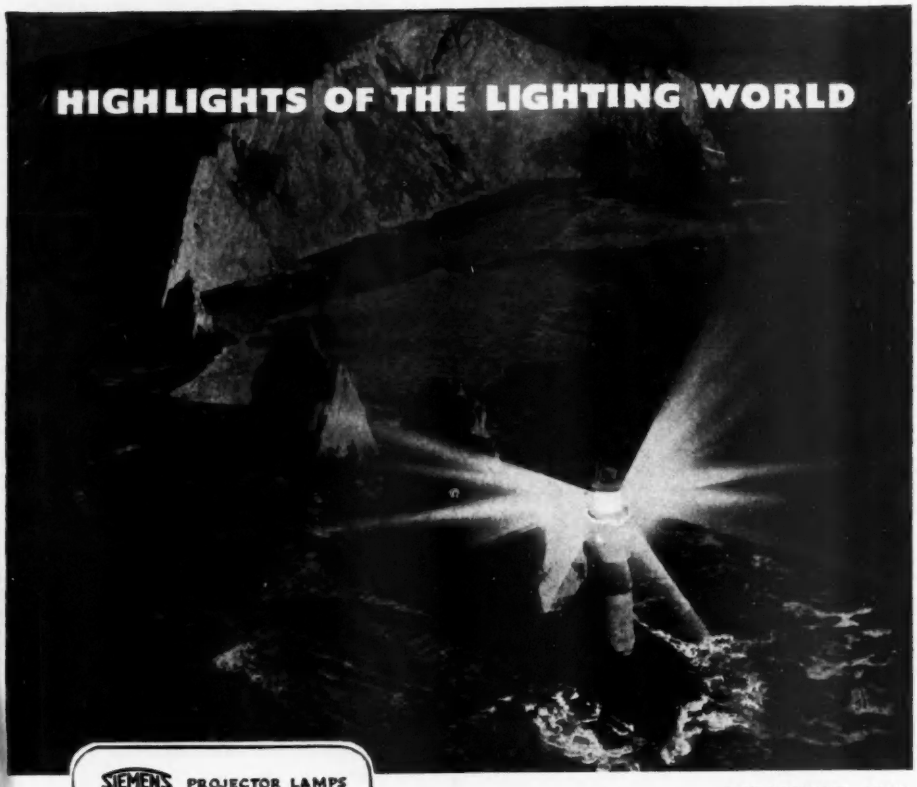

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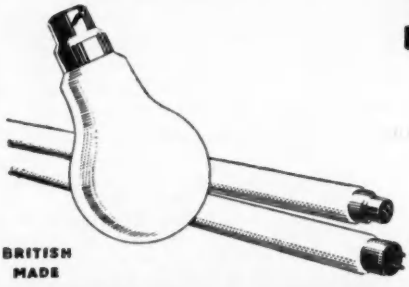

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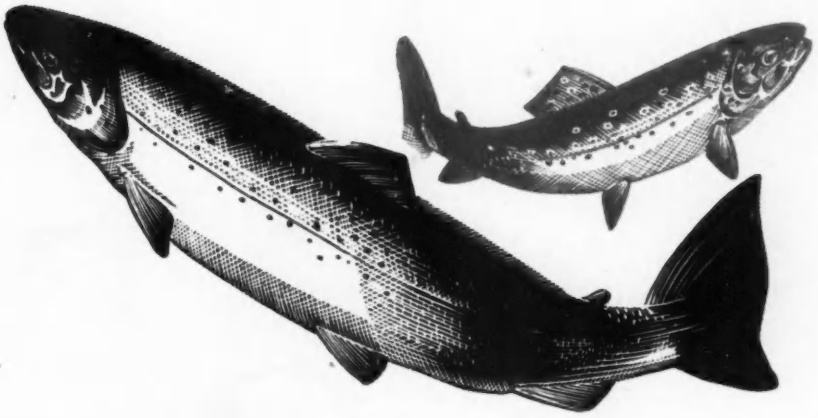

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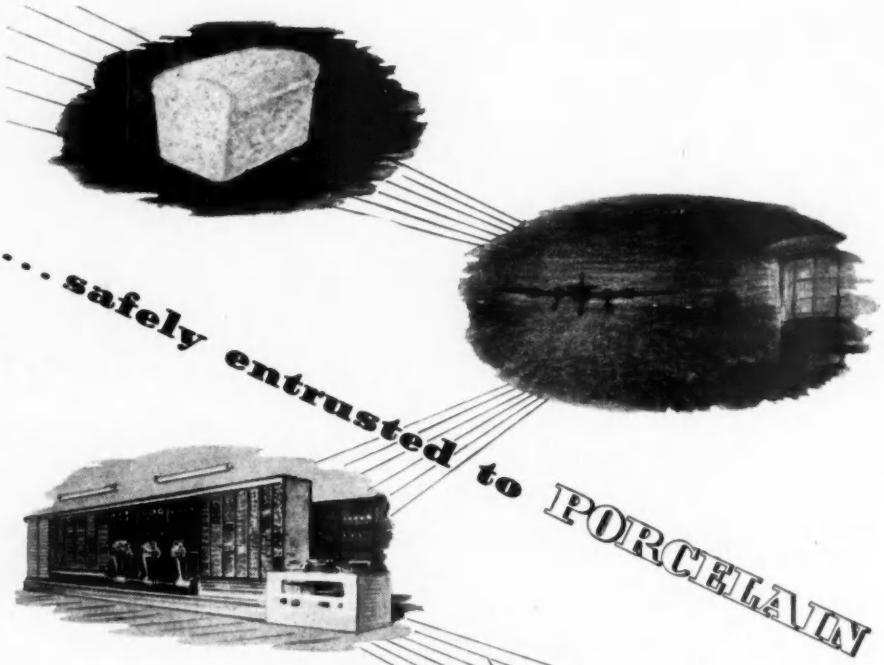

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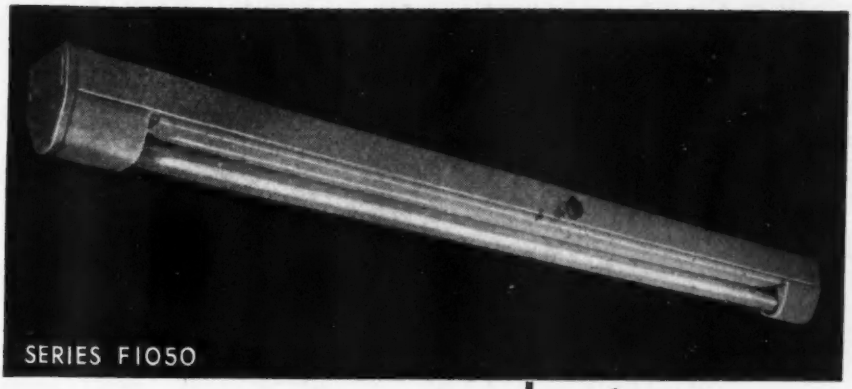

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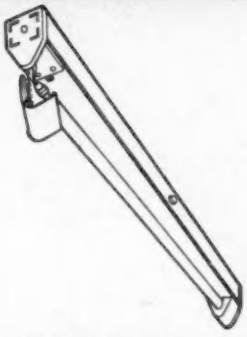
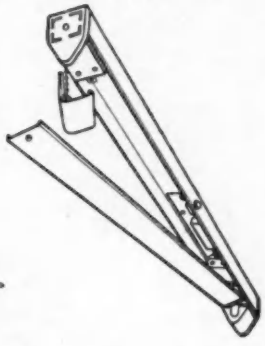


For immediate access to lamp-holders, slide end-covers towards centre of fitting. End-covers will then come away.



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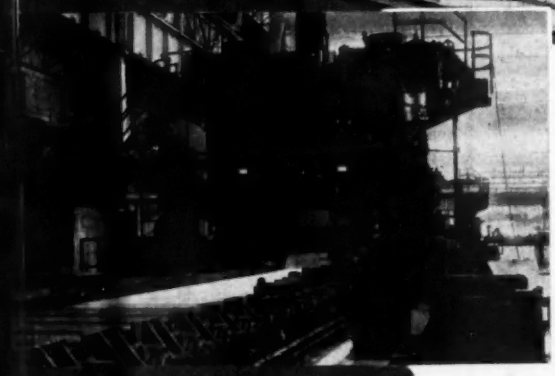

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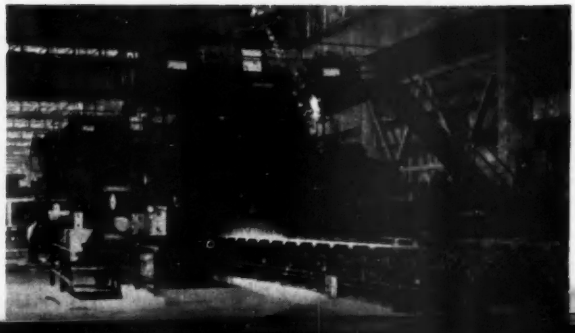

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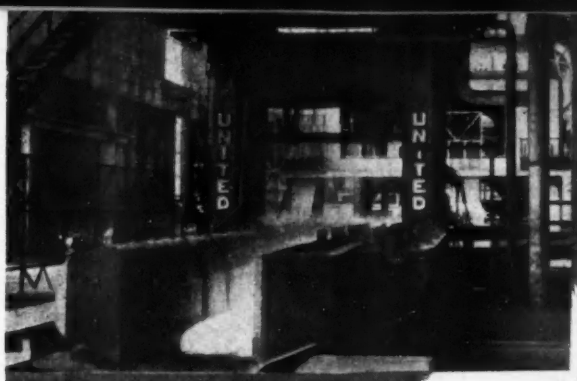

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ELECTRICAL TIMES

Vol. 120 No. 3119 THURSDAY, 16 AUGUST, 1951

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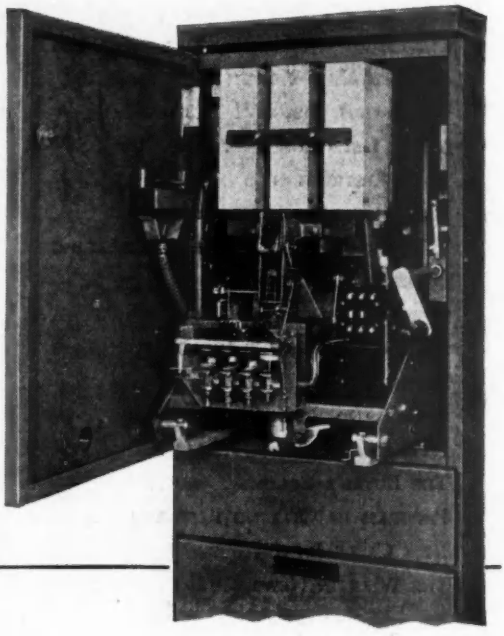

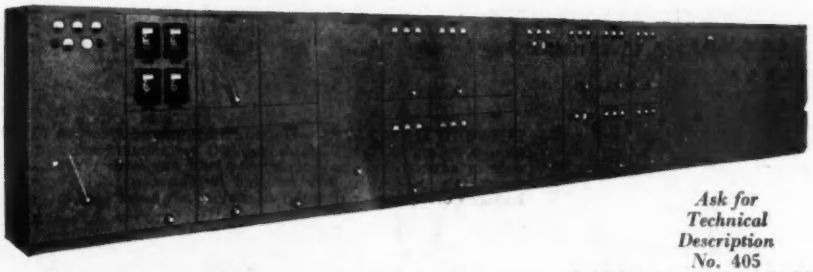

Ask for Technical Description No. 405

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Editorial

WINTER OF DISCONTENT

AFTER the many forewarnings of a desperate winter shortage of electricity, the depressing data on which they were based were presented in a White Paper published last week. On top of all the danger and difficulties from reduced voltage and frequency, the country will still be no less than 1,200 MW short in a cold spell. That is the B.E.A's estimate: that is the amount that must be spread or shed. The committee responsible calls for a doubling of last winter's effort at industrial load spreading and even this back-to-1947-conditions will make good no more than half the deficit. Responsibility for the saving of the remaining 600 MW is passed to the commercial and domestic consumer and to the new regional committees that are to be constituted to obtain their co-operation. Even with a mild winter, balance will not be easy to achieve, but with a cold spell calling for at least a 20% saving extending over five and a half hours a day, the absence of load cuts is too much to expect. And it is difficult to be optimistic about the next few winters to come. Demand is rising faster than anticipated, while plant programmes, already proved inadequate by experience, are falling behind schedule by no less than 33%. This is no state in which to face the necessary higher level of exports required; it is certainly no state in which to meet the expanding demands of a re-armament programme. Let those in authority be reminded that, in these days, the tools which finish the job are electrically powered.

—AND WORSE

BUT gloomy as the prospect is painted in the White Paper, it now appears in even more sombre shades. The figures prepared by the B.E.A. carried the proviso of no dislocation of solid fuel supplies, but even while the report was printing, the heavy hand of rationing struck at supplies of domestic fuel. It is not possible to estimate what effect this severe blow to coke availability will have on electricity demand, but unquestionably it will be considerable. The use of slow combustion stoves for water and background space heating is so widespread, that the limitations constitute a further serious threat to electricity supply. A probable increase in immersion heaters installation may, in itself, be innocuous. More serious will be the wider use of electricity to conserve fuel in the between seasons, leading to heavy loads in the autumn when plant is still under overhaul, but since the ration itself is of a precarious quantity, the gravest danger lies in the greater usage of electric fires in the winter.

THE MINISTER'S PETARD

THE very severity of the coke ration suggests that its imposition has been unduly delayed. Certainly it would not have been introduced before it became essential, since the Ministry of Fuel has made no secret of its love for solid fuel domestic appliances. By propaganda of all descriptions it has advocated their use, even to the extent of having a directive issued that only smokeless fuel burning appliances shall be installed in new houses, whether privately or council built. It is not possible to estimate how far this policy is responsible for the present shortage, but it must certainly form a substantial part of the 37% increase in consumption over that of last year. The possible effect of coke rationing on electricity has already been discussed, while any further increase in the demand for gas will merely aggravate the situation by the greater consumption of coke at gasworks for the production of water gas, which is already a major contributory factor to the

coke shortage. In so far as it is possible to carry out a fuel co-ordination policy with a shortage of coal, this is one of the first manifestations of it. This, together with the shortage of electricity must be the first problem to face the committee on fuel and power which is to study, under Viscount Ridley's chairmanship, the best use which can be made of the country's resources in this field. But by its very terms of reference, announced over the weekend, the committee's task is too great a one to improve the short-term prospects of a season that may indeed be marked as a winter of discontent.

In discussing peak load problems, it has to be remembered that early last winter coal shortages caused rather more worry in regard to generation than did generating plant troubles. Whatever may be the outlook for industry generally and for domestic coal supplies in the coming cold months, a remarkable improvement has taken place in power station coal stocks, which reached their lowest level since 1947 last February, *i.e.* 2·54 million tons. In the six months that have passed since then, they have been built up to 4·56 million tons, equivalent to 5·2 winter weeks supply with eight more stocking weeks to come. The 19% increase on last year's equivalent position, which this achievement represents, stands out prominently when compared with the 7·8% increase in the country's total stocks. Another factor to be taken into account when estimating the magnitude of the task carried out is the average temperature during the first six months of this year—more than three degrees colder than last year. This has had the effect of increasing coal consumption for electricity generation by 5% or some 0·9 million tons in the period considered. Certainly a remarkable task has been accomplished, though perhaps it has been to some extent at the expense of industry.

HOLD-UP?

IT is rather surprising that nothing has yet been heard of the setting up of the separate secretariat of the British Electric Power Convention. This was recommended in the Annual Report adopted without demur at Brighton, yet no further action appears to have been taken in the matter, despite the difficulty of obtaining office accommodation. With the approach of autumn it is time to be thinking of next year's programme and it is obviously better that this should be done under the modified regime. There can be nothing but praise for the B.E.A.'s tactful handling of the Convention, but with their delegate representation less than 50% they cannot in fairness be left to foot the bill. If the electrical industry is worthy of a national convention it deserves a national independent secretariat.

Meteor

THIS WEEK'S PHOTO

BRAEHEAD power station, now nearing completion on the south bank of the River Clyde, four miles downstream from the centre of Glasgow, will be operated by the South West Scotland Division of the British Electricity Authority. The generating plant will consist of four 50 MW Parsons three cylinder reaction turbines coupled to alternators generating at 11 kV. This voltage will be stepped up to 132 kV by Ferranti transformers and the output controlled by Reyrolle low-oil-content pneumatically-operated indoor switchgear. There will be eight Babcock and Wilcox 300 klb/hr boilers operating at 900 lb/s.i.g. and at a temperature of 900° F. at the stop valve, the feed water temperature being 390° F.

The first section, which is to go into commission very shortly, comprises two sets and four boilers.

The boilers, which are centrally controlled, are pulverised fuel fired on the unit system, three mills and six burners being provided per boiler. Water for cooling is drawn from and discharged back into the Clyde, obviating the need for cooling towers. Ash handling is by high pressure water-sluicing. House services are supplied from 7·5 MVA 132/3 kV transformers, with control by air insulated switchgear; all the main and the principal auxiliary switchgear is operated from a central control room.

Coal is to be supplied by both water and rail, Mavor and Coulson plant being installed to convey the fuel to the boiler house and storage ground.

The main civil engineering contractors are J. Mowlem and Co., the consulting engineers being Sir Alexander Gibb and Partners, while Merz and McLellan are consultants for the mechanical and electrical equipment.

ELECTRICAL TIMES POWER STATION SERIES
No.76. Braehead.

CAPACITORS *can increase* LINE CAPACITY

Consideration of Design of Short Overhead Lines leads to Recommendations for Series Capacitor Compensation in this article by two South African Engineers

by **Prof. A. HEYDORN**, Dip.Ing., M.(S.A.)I.E.E.
and
J. VAN ROOYEN, B.Sc.

IN calculations of normal and steady-state conditions appertaining to power lines, the voltage regulation and power loss denote the efficiency of the system. The one factor decides the merit of service to consumers, the other is expenditure to be borne by the supplier. The magnitudes of these functions depend upon the length of transmission line, size of conductors, and in the case of a.c. lines, also the spacing of conductors. The magnitude and power factor of the load substantially affect the ultimate figure. Thus, we are faced with six variables in the design of a system.

In order to obviate the lengthy process of starting from fundamental principles, an attempt is made to simplify this process. This can be done by combining the various factors into more general expressions, and plotting these against the relevant variables.

The investigation is confined to short lines, i.e., lines where the resistances and reactances can be assumed concentrated at one point, without introducing considerable error in calculations. In this event, the charging current due to capacitance between conductors is also neglected as it does not influence the receiving end voltage to any appreciable extent. Line lengths up to 75 miles with service voltages up to 88 kV fall under this classification. It is also possible, in the case of longer lines that less error is introduced by this lumped impedance method, than by the arbitrary estimation of load values.

Key to Symbols used.

V_1 = Station end line voltage.
V_2 = Receiving end line voltage.
P = 3-phase power at station end.
$\triangle V$ = Phase voltage drop on line.
V_{kv} = Nominal line kV or station end kV.
ϕ = Angle of current lead or lag at receiving end. (See assumption on p. 277). Considered positive for lagging current.
R = Total resistance of line/phase. $= Lr$
L = Line length in miles.
r = Resistance per mile per phase.
X = Total reactance of line. $= Lx$
x = reactance per mile per phase.

Voltage Drop

The following useful formula for the calculation of this drop is approximately true.

Voltage drop = Resistance × dissipative current + reactance × wattless current.

This drop is defined as the algebraic difference between V_1 and V_2.

Thus $\triangle V = |V_1| - |V_2|$
$= RI \cos \phi + XI \sin \phi \ldots . (1)$

Where $I \cos \phi = I_w$ dissipative current
$I \sin \phi = I_b$ wattless current.

Line Constants

r is found from tables. x is due to the changing magnetic field. The following formula gives values of x:—

$$x = 2\pi f (0{\cdot}08 + 0{\cdot}741 \log_{10} \frac{D}{\varrho}) 10^{-3} \text{ ohm/mile/phase}$$

Where ϱ = Radius of conductors, D = Geometric mean of conductor spacings. This value varies due to the multiplicity of arrangements encountered in practice and in general increases with the service voltage without any definite proportion.

In Figure 1, r and x are shown against standardised conductor sizes and spacings. In this article, calculations are based on these figures. Composite conductors and aluminium lines are disregarded. Transformer impedances are also neglected.

Regulation and Transmitting Capacity

On a percentage basis for 3-phase lines, we have:—

Percentage voltage drop $v\% =$

$$\frac{\sqrt{3}\,\triangle V}{V_{kv}} 10^{-1} = \frac{\sqrt{3}\,IL}{V_{kv}} (r \cos \phi + x \sin \phi)\, 10^{-1}\,\%$$

Substitute I from

$$I = \frac{P}{\sqrt{3}\, V_{kV} \cos\phi} \quad \ldots\ldots(3)$$

Hence $v\% =$

$$\frac{PL}{V_{kV}^2}\,(r + x\tan\phi)\,10^{-1} \quad \ldots\ldots(4)$$

It is assumed in expression (3) that the angle θ between V_1 and V_2 is very small and hence that ϕ at the station end and receiving end, is the same.

Equation (4) may be written:—

$$PL = \frac{10\,v\%\;V_{kV}^2}{r + x\tan\phi}\ \text{kW-miles} \quad \ldots\ldots(5)$$

PL is termed the "moment of power" of a line of specific construction and transmission voltage. For a definite voltage drop v%, eq. (5) is seen to be independent of line length. For example, a 3-phase line consisting of 0·15 sq in. copper cables, geometric mean spacing distance 48 in. and 33 kV service voltage yields from Fig. 1:—

$r = 0{\cdot}291$ ohm/mile/phase
$x = 0{\cdot}55$ ohm/mile/phase

With 5% voltage drop and power factor $\cos\phi = 0{\cdot}8$ ($\tan\phi = 0{\cdot}75$) the power moment

$$PL = \frac{10 \times 5 \times 33^2}{0{\cdot}291 + 0{\cdot}55 \times 0{\cdot}75} = 77{,}400\ \text{kW-miles}$$

The product PL may be arrived at by multiplying any two values. Hence a line 60 miles long is capable of transmitting $\frac{77400}{60} = 1290$ kW at 0·8 power factor and 5% voltage drop.

Similarly 3,870 kW gives 5% voltage drop over 20 miles at $\cos\phi = 0{\cdot}8$.

Power Transfer Capacity

For more extensive use, graphs may be plotted giving PL against conductor sizes for various power factors. It is, however, necessary to repeat this to cover different voltages. In order to obviate this, the "transfer capacity" is introduced.

$$\frac{PL}{V_{kV}^2} = \frac{10\,v\%}{r + x\tan\phi}\ \text{mho-miles} \quad \ldots\ldots(6)$$

This expression has the dimension of the load conductance times line length. It is fixed for a definite support design, voltage drop and power factor. Hence it can be used with advantage to define the electrical characteristics of a line independent of its length and voltage, depending only upon its construction.

In most cases where power is transmitted without voltage control through induction regulators, phase modifiers, etc., 5% regulation will be the maximum permissible. In Fig. 2 the set of curves give the corresponding transfer capacities for various conductor sizes for different power factors and conductor spacings within the limit of 5% regulation.

It will be seen from eq. (6) that these curves (Fig. 2) could be used for regulation values other than 5%, by a simple multiplication.

$$\text{Hence}\ \left[\frac{PL}{V_{kV}^2}\right]_1 = \frac{PL}{V_{kV}^2} \times \frac{v_1}{v}$$

in the case of $v_1\%$ voltage drop.

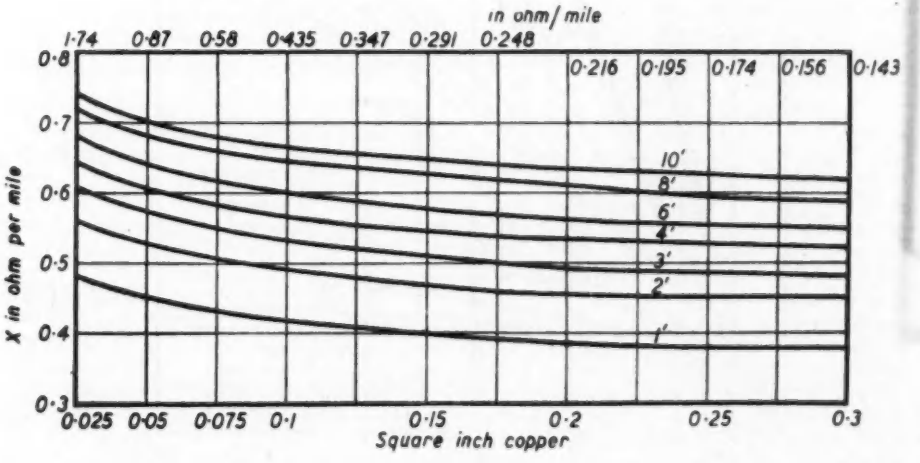

Fig. 1. Resistance and reactance of overhead lines in different copper sizes and conductor spacings at 50 c/s

(Resistance values are given horizontally at the top of the figure in ohm/mile)

The transfer capacity with 2½% regulation, is 0·5 times that with 5%.

When cos $\phi=1$ (in eq. 5), then tan $\phi=0$. In this instance, the reactance is thus cancelled and the line behaves like a d.c. line. Hence, the transfer capacity is a linear function of the conductor size. When the current is lagging, the term x tan ϕ in eq. (6) increases with the wattless component and causes the curves to droop more and more. A horizontal line is approached for low cos ϕ values. The implications are obvious. At low lagging power factor, no useful purpose is served by increasing the conductor size.

Against this, in the case of leading power factor, the term x tan ϕ being negative, causes an increase in transfer capacity approaching infinity, with increasing leading reactance power. This implies, referring to eqs. (1) and (2), that the voltage drop cannot reach 5% whatever the load may be. With a further increase in the leading current, the voltage drop becomes negative, i.e. when $x \sin \phi > r \cos \phi$. In this instance, the voltage at the receiving end is actually higher than at the station end.

Approximate values of transfer capacity

Cos ϕ	...	...	0·5	0·8	0·98	1·0
0·15 sq in.	...	...	40	80	130	180
0·25 sq in.	...	...	50	100	200	300

Finally, Fig. 2 provides a set of useful

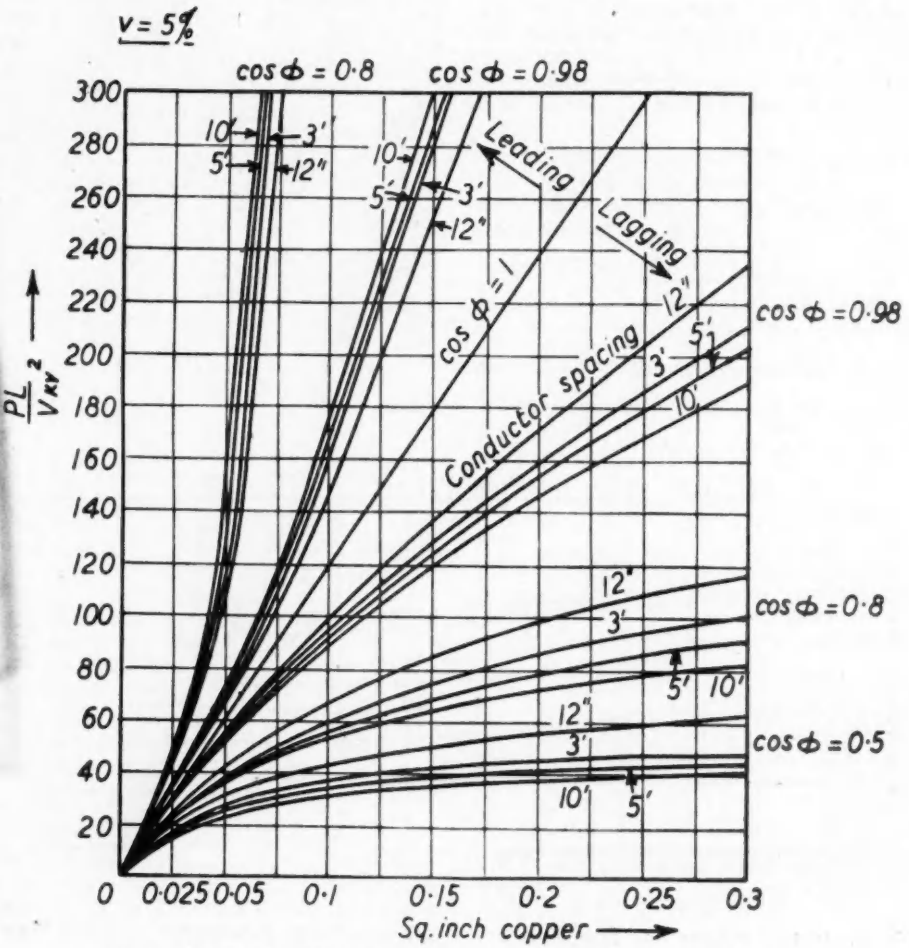

Fig. 2. Chart of the transfer capacity for 5% voltage drop over the line

approximations which illustrate the influence of the power factor on the transmission capacity better than any other consideration. Two commonly used conductors, one of heavy and the other of light section, are taken to illustrate the case.

Power Loss

The voltage drop is accompanied by a power loss. The consumer shares in the adverse effects of voltage depression due to inefficient operation of apparatus, with the supplier, who suffers from the result of diminished energy available at the load end. The power loss on the line, however, is a matter to be considered and borne by the supplier only. To him, an assessment of these losses is important, the exclusion of which would render any calculation incomplete.

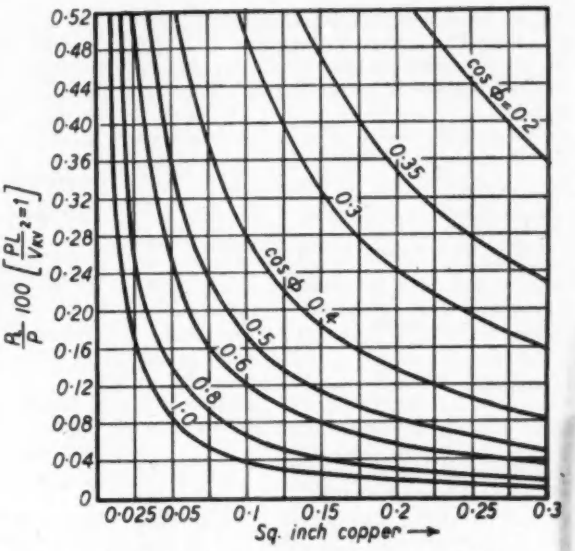

Fig. 3. Percentage power loss at different power factors

The power loss on a 3-phase line is:—

$P_L = 3\ L\ r\ I^2\ .10^{-3}$ kW.....(7)

Substitute the value for I from eq. (3)

Hence

$$P_L = P \times \frac{PL}{V_{kV}^2} \times \frac{r}{\cos^2\phi}\ 10^{-3}\ \text{kW}....(8)$$

The percentage power loss will be

$$p_L\% = \frac{P_L}{P} \times 100\%$$

$$= \frac{PL}{V_{kV}^2} \times \frac{r}{\cos^2\phi} \times 10^{-1}\%\ .....(9)$$

This can be illustrated graphically by taking $\frac{PL}{V_{kV}^2}$ as unity and shewing $p_L\%$ against conductor size (or r) for various power factors.

From the graphs the percentage power loss per unit transfer capacity for various values of power factor, can readily be found for different conductor sizes. The rapidly increasing power loss with decrease in power factor (lagging or leading) is particularly noticeable.

The following examples illustrate the application of Figs. 1, 2 *and* 3.

500 kW, cos ϕ=0·8 has to be transmitted over 50 mile line, ensuring less than 5% voltage drop. Determine a suitable conductor size and voltage. The requisite power transfer capacity PL=500×50=25,000 kW-miles. As possible voltages take 11, 22, 33 and 66 kV, respective distances being 3, 4, 5 and 8 ft.

The calculated values are tabulated as follows:—

1. Station end voltages kV ...	11	22	33	66
2. Conductor spacing ft	3	4	5	8
3. $\frac{PL}{V_{kV}^2}$	207	51·5	22·9	5·74
4. From Fig. 2 conductor sizes inch²	—	0·075	0·025	—
5. From Fig. 3 $p_L\%$ $\left[\text{with } \frac{PL}{V_{kV}^2}=1\right]$	—	0·09	0·27	—
6. $p_L\%$ = line 3 x line 5	—	4·65%	6·2%	—

It is obvious from this that 11 kV is quite unsuitable, whereas with 66 kV, the conductor size required is mechanically too weak and a larger size would mean unnecessarily high capital investment. A choice remains between 22 and 33 kV, with respective sizes 0·075 and 0·025 sq in. As regards voltage drop, the second case yields a comfortable margin with a third less copper. The power loss, however, will be higher. The final choice will depend on further economical and practical considerations influenced by local circumstances.

Given: 75-mile 33 kV line, comprising three 0·15 sq in. conductors with 4 ft spacing. What power can be transmitted at cos ϕ=1·0, 0·8, 0·5, giving 5% maximum voltage drop? What is the power loss in each case?

The required values are found from lines 4 and 6. The curves in Figs. 2 and 3 thus provide a very useful basis for further calculations regarding the financial and economical aspects.

1. Cos ϕ	1·0	0·8	0·5
2. From Fig. 3 $\frac{PL}{V_{kV}^2}$ ...	178	70	41
3. PL = line 2 x $(33)^2$ kW-miles	195,000	76,600	44,900
4. P = line 3 x $\frac{1}{75}$ kW ...	2,600	1,020	600
5. From Fig. 4 $P_L \div \frac{PL}{V_{kV}^2}$	0·0291	0·046	0·116
6. p_L% = line 5 x line 2	5·18	3·22	4·75

The Compensation Factor

The percentage voltage drop on a 3-phase line from eqs. (1) and (2) is:—

$$v\% = \frac{\sqrt{3}\,L}{V_{kV}} (I_w r + \gamma\, I_b x)\, 10^{-1} \ldots\ldots\ldots (10)$$

The first part is dependent upon the dissipative current and the resistance of the line. No compensation device can alter these quantities since they represent the power demand of the consumer and the conductor size. In the second term, the wattless component of the load current and the reactance of the line, can both be compensated by means of capacitors. Hence the compensation factor γ is added in eq. (10). Without any compensation, $\gamma = 1$ and it is less than unity with compensation. In principle γ can be associated with either I_b or x, hence $(\gamma I_b)\ x$ or $I_b(\gamma x)$. The actual case depends upon the position in the circuit of the capacitor. Firstly, the wattless current may be adjusted by means of parallel capacitors, thus altering the load current, or secondly the reactance of the line is modified or compensated by connecting capacitors in series without altering the load current. In both cases the voltage drop is reduced.

For a given voltage drop v% the definition of γ is:—

$$\gamma = \frac{I_b x \text{ (compensated)}}{I_b x \text{ (uncompensated)}} \ldots\ldots (11)$$

Substituting

$$I_b = \frac{P \tan \phi}{V_{kV}\sqrt{3}} \text{ and } I_w = \frac{P}{V_{kV}\sqrt{3}} \ldots (12a) \text{ \& } (12b)$$

In (10): $v\% = \frac{PL}{V_{kV}^2} (r + \gamma\, x \tan \phi)\, 10^{-1} \ldots (13)$

Hence: $\gamma = (10v\ \frac{V_{kV}^2}{PL} - r)\ \frac{\cot \phi}{x} \ldots\ldots (14)$

The capacitor current which is necessary for maintaining the regulation within specified limits, is expressed in terms of γ. Take first parallel compensation: the load and capacitor wattless currents add up in the circuit, while the reactance of the line remains constant. The capacitor current when in parallel connection is:—

$$I_{cs} = (1 - \gamma)\, I_b \ldots\ldots (15)$$

The kVAr rating of the capacitor is:—

$$Q_s = I_{cs}\ V_{kV}\sqrt{3} = (1-\gamma)\ I_b\ V_{kV}\sqrt{3} = (1-\gamma) S \sin \phi \ldots\ldots (16)$$

$S \sin \phi = I_b\ V_{kV}\sqrt{3}$ designates the transmitted reactive power.

Taking series compensation, the line and capacitor reactances are summated. The reactance of the capacitor is thus given by:—

$$x_k = (1-\gamma)x \ldots\ldots (17)$$

The series capacitor rating for a given load-current (I) and power factor ($\cos \phi$) will be:—

$$Q_k = 3\, L x_k\, I^2\, 10^{-3} \text{ kVAr} \ldots\ldots (18)$$

Substitute $I = \frac{P}{\cos \phi\ V_{kV}\sqrt{3}}$ in (18) using (17)

$$Q_k = \frac{PLS\ (1-\gamma)x}{\cos \phi\ V_{kV}^2}\ 10^{-3} \ldots\ldots (19)$$

Where $S = \frac{P}{\cos \phi}$ represents the transmitted kVA

Capacitor Ratings

From eqs. (16) and (19), the capacitor ratings required for a specified transfer capacitor and power factor giving regulation within specified limits, can be determined, and a comparison drawn between the two cases.

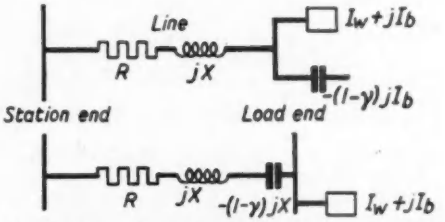

Fig. 4. Expressions for parallel (top) and series (below) capacitor compensation

$$\frac{Q_k}{Q_s} = \frac{10^{-3}\,(1-\gamma)x\ PLS/V_{kV}^2}{(1-\gamma)\ S \sin \phi \cos \phi} = \frac{x}{\sin \phi \cos \phi} \times \frac{PL}{V_{kV}^2}\ 10^{-3} \ldots\ldots (20)$$

The ratio of series capacitor rating to parallel capacitor rating for $PL/V_{kV}^2 = 1$ for some practical values of reactance per mile, is shown against power factor in Fig. 5. The function $\frac{x}{\sin \phi \cos \phi}$ reaches infinity for $\cos \phi = 0$ and unity, but yields a fairly flat curve for intermediate values.

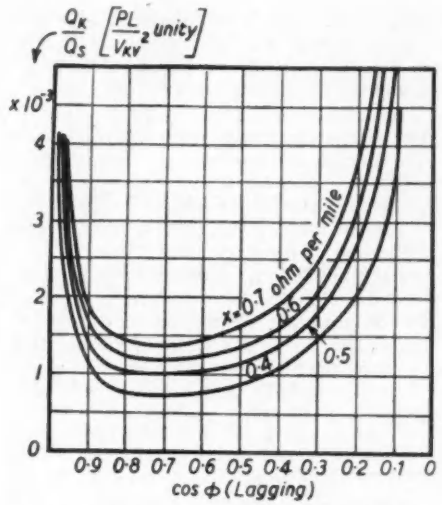

Fig. 5. Proportion of series capacitors to parallel capacitance for equal compensation

In the case of the assumed values for x, the main part of the curves lie between $\frac{Q_k}{Q_s}=0{\cdot}75$ and $1{\cdot}5\times10^{-3}$. If for $\frac{PL}{V_{kV}^2}$ the fairly high value of 150 is taken (Fig. 3), then $\frac{Q_k}{Q_s}=1$ when

$$\frac{x}{\sin\phi\cos\phi}=\frac{1}{150}=6{\cdot}7\times10^{-3}.$$

It is clear from Fig. 5 that this value is only reached near $\cos\phi=1$ and 0. $\frac{Q_k}{Q_s}$ is hence usually considerably smaller than unity. Therefore, the series capacitance required to give the desired voltage regulation is in the majority of cases, much smaller than the parallel capacity required to achieve the same result.

For example, 2,500 kW at $\cos\phi=0{\cdot}8$ is to be transmitted over 25-mile, 22 kV line comprising three 0·2 sq in. copper conductors spaced at 4 ft distance. Determine the shunt and series capacitance required to limit the voltage drop to 5%.

The resistance and reactance of the line is $r=0{\cdot}216$ and $x=0{\cdot}54$ ohm. The transfer capacity of the line must be:—

$$\frac{PL}{V_{kV}^2}=\frac{2{,}500\times25}{22^2}=129$$

The compensation factor γ is determined from eq. (14):—

$$\gamma=\left(\frac{10\times5}{129}-0{\cdot}216\right)\frac{1{\cdot}33}{0{\cdot}54}=0{\cdot}425$$

From eqs. (16) and (19) follow the series and parallel capacitor values.

$$Q_s=(1-0{\cdot}425)\,2{,}500\times0{\cdot}75=1{,}080\text{ kVAr}$$

$$Q_k=(1-0{\cdot}425)\,0{\cdot}54\times\frac{2{,}500^2\times25}{(0{\cdot}8)^2}10^{-3}=156\text{ kVAr}$$

The value of $\frac{Q_k}{Q_s}=\frac{156}{1{,}080}=0{\cdot}145$, also follows from eq. (20) or from Fig. 5.

The result arrived at in this specific case, namely that with series capacitors, the value of capacitance required is only 14·5% of that required for parallel capacitors, together with the general results derived from Fig. 6 corresponding hereto, shows that this rarely used method offers economical advantages which make it worth while considering when designing power lines. Apart from this, series compensation possesses the further advantage that its compensating action which becomes a line property, is independent of the load, and that it acts without any time delay. On a compensated line, the voltage fluctuations due to changing inductive loads such as taken by bore hole pumps, mills, etc., can be smoothed out to a large extent. No other regulator is capable of functioning continuously at such a rate.

Series Compensation in Practice

The fact that we are apparently accustomed to thinking in terms of parallel compensation for transmission problems, is not the only reason why series compensation is not applied more often in practice. The practical obstacle posed is that series capacitors are subject to voltage variations according to the load changes. Within the limits of normal load and overload, the capacitor voltage reaches 20% of the system phase voltage. No trouble would be experienced on this score, but in the event of short circuits on fully compensated lines, i.e. resonance at system frequency, 125% of phase volts might appear across capacitor terminals. This, of course, depends on conductor sizes and distances. Thus, either the capacitor has to be insulated for this voltage, and capable of carrying the short-circuit current until circuit

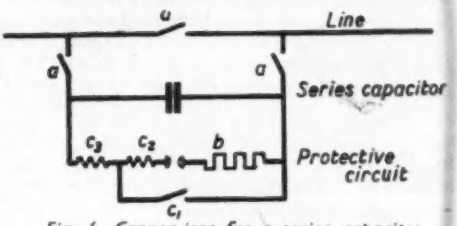

Fig. 6. Connections for a series capacitor

interruption occurs, or it is shunted instantaneously by some means. Some American installations incorporate arc gaps and contactors for automatic short circuiting of the capacitor terminals, in the event of excessive currents on the line. Some have been operating successfully for over ten years.

A phenomenon which becomes more apparent in the series compensated line, is the enhanced conductivity offered to harmonics present in the magnetising current of magnetically strongly saturated transformers and motors. Remedial measures take the form of resistances in parallel with the capacitors. It should be borne in mind also that the line current is actually reduced for parallel compensation, and hence the line losses and thermal stresses imposed on transformers and generators. This is not the case with series compensation. The difference between losses in the two cases can be calculated directly or found with the aid of curves in Fig. 3.

A valuation of the particular merits of any one scheme depends upon the cost of electricity. The losses in the case of coal or hydro stations might not carry too much weight. With diesel power, however, this might be very important.

Finally, it might be said that series compensation on transmission lines, as a means of voltage regulation, provides in certain cases considerable advantages compared with parallel compensation or other forms of regulating equipment. A careful study of its special distinctive features compared with parallel compensation will be necessary to achieve the required degree of success.

Chambers of Commerce tell the B.E.A.

MAXIMUM physically possible plant commissioning, an effective method of warning industry of impending power cuts, extended load spreading arrangements, and assured supplies of domestic fuel: these are the principal recommendations made by the Association of British Chambers of Commerce in a memorandum sent to the Chancellor of the Exchequer and the Minister of Fuel and Power. In a letter sent with the memorandum, the Association stressed the urgent need for increased capital expenditure if the B.E.A. is to be expected to narrow the dangerous gap between electricity demand and supply.

The memorandum is the result of six months' work by a technical committee set up by the Association under the direction of Mr. HARRY YATES (Colvilles Ltd.). As its principal aim, the committee had the review of the electricity supply position afresh in the light of current development and present-day conditions.

After reviewing the general nature of the peak-load difficulty and of plant shortage, the rectification of which is estimated as involving the capital expenditure of about £130 m, the memorandum goes on to consider plant commissioning programmes, taking note particularly of recent experience of breakdown and maintenance. Apart from governmental financial support, the simplifying of present procedure for securing consent for power station erection, and the use of larger generating sets, up to 200 MW or more, are suggested as effective contributions to speedier development of plant capacity.

To secure maximum use of power-station plant, the memorandum suggests more attention to preventive maintenance, and in particular to the development of tools and equipment used in this work. Mobile equipment is considered as worthy of investigation. For the purposes of securing higher boiler availability, it is considered of paramount importance that quality and quantity of power station coals should be improved. In this connection, it is noted that the intended output of opencast coal will only last over the next five years, and so can only effect temporary assistance.

Shedding and Spreading

Co-operation of consumers connected to the same feeder, with the object of guaranteeing load reduction in the absence of load cuts is recommended by the Association as a desirable step. Then, since the plant shortage is likely to remain for some years, some effective control system should be arranged to ensure load shedding by domestic consumers so that an adequate degree of priority may, if necessary, be given to industry and commerce. Finally, in this section of the memorandum, comes a plea for warning of power cuts, so that danger to workers and operators may be avoided, and the loss of valuable raw materials reduced.

Application of high tariffs as a deterrent to peak loads is considered ineffective and deplored. More effective, it is felt, would be attention to the Clow Committee's comment that fear of a solid fuel shortage has been a potent factor in the peak load problem affecting consumers. It is considered that insufficient regard has been paid to this important question over the past few years, and that the position has not improved.

The Association is convinced that the closest liaison between the B.E.A. and representatives of industry and commerce are necessary now and for several years to come, and local Chambers of Commerce, in association with other organisations are urged to initiate the formation of local committees to effect this liaison.

Our readers' views . . .

Fluorescent Lamps on D.C.

I WOULD like to reply to Mr. Harold Turner's letter in your issue of July 26 regarding the operation of fluorescent lamps on d.c. Mr. Turner's argument is, of course, perfectly sound under the particular conditions which he postulates, namely operation of the starter switch at one particular instant of switching cycle, but in practice this can only happen occasionally.

Starting is generally achieved by a series of makes and breaks, during which the lamp electrodes gradually build up a sufficient temperature for adequate thermionic emission and it is more than improbable that each break should occur at the instant of zero current.

The voltage surge created by the operation of the starting switch is, of course, only one factor in starting a fluorescent lamp. The high peak value of the a.c. wave form is in itself as important in bringing the gas in the lamps up to an appropriate degree of excitation.

Apart from these considerations the necessary use of a thermal starter switch on d.c. under conditions of low mains voltage is more likely to lead to unstable operation than when lamps are used on a.c. in conjunction with starters of the voltage operated pattern.

W. A. R. Stoyle

GENERAL ELECTRIC CO. LTD.

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Compulsory Suppression

IN his Notes on the above, "Megohm" rightly stresses the necessity for careful earthing of equipment in order to guard the user against shock in the event of condenser breakdown, but my experience has been that direct earthing is likely to have the effect of intensifying interference, especially of the mains-borne variety.

This is rather borne out by a comment in the publication "Electrical Accidents and their Causes, 1937," issued by the Home Office, on page 26—"It is an unfortunate fact that the existence of an earthing conductor increases interference. . . . if earth chokes are used, however, the carrying capacity must be related to the circuit excess current protection, which in ordinary factory practice would mean heavy and awkward chokes for which it is difficult to find a place."

I should like to mention, for the benefit of others faced with this problem, that the use of the ordinary standard earth leakage circuit-breaker will both effectively earth the equipment, and by reason of its highly inductive trip coil provide a most effective choke in the earthing conductor. This practice has been found satisfactory in several troublesome cases of mains-borne interference, and in which chokes in the earthing leads have been the only apparent remedy. Prior to this, the only effective suppression involved the removal of the earthing conductor.

T. C. Gilbert

FOLKESTONE M.I.E.E.

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Uncertified Engineers

WITH reference to the correspondence on Uncertified Engineers, if we accept differentiation between the practical and academical qualifications, there should be no need for competition. Not being a mathematician I am not an associate member of either the I.E.E. or I.M.E.; but as an electrical fitter of much experience, I have had co-operation from members of both Institutions and this has been of advantage both to myself and to those firms by whom I have been employed.

One thing I do ardently yearn for is more co-operation between the directors and technical staff so that we practical men shall not be confronted with the difficulties of installation and maintenance arising from curtailment of material due to the skimping of production costs.

L. Cole

CLAPTON

◆ ◆ ◆

CORRESPONDENTS have laid great stress that I.E.E. membership is documentary proof of an engineers ability, and uncertified engineers can produce no such evidence, but it might well be argued on behalf of the latter that the fact they have obtained and held their positions in competition with their certified colleagues is better proof of their ability.

Be this as it may, such arguments on both sides do nothing to solve the problem, and uncertified engineers do not ask for mere letters after their names, as their value can in any case only be judged by ascertaining how

they were obtained; so may I suggest a more constructive proposal to meet this claim for recognition?

The issue lies between academical qualifications and practical experience in doing the job with unrecognised technical training. The I.E.E. caters for the former in three grades:- but for the latter only by A.I.E.E., the qualification for which is only 5 years practical experience. This obviously has no attraction for the uncertified engineer holding a responsible post and having twenty to thirty years experience; and adds nothing to his status.

I suggest therefore that the I.E.E. introduce a series of grades for them, in which years of experience and positions held should be the deciding factors, and thus give balanced membership for certified and uncertified engineers.

It is generally recognised by uncertified engineers that they cannot hope for the same status as the academically trained engineer who also has the requisite experience, but these men are few, and below them is a mass of engineers in each category who do their work with equal aptitude but the I.E.E. only recognise one branch, and not least of its services is passing its experience on to the men who will eventually surpass them.

L.V.T.

NORTH WALES

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I SHOULD like to reply to the correspondence on the above subject in your issue dated August 2nd. I do not doubt Lindsay Crawford is a member of a chartered institute, neither do I doubt that he holds an engineering degree and I require no proof. I will agree that there are more uncertificated engineers than otherwise in the country, but I fail to see how Lindsay Crawford knows that "they are *all* doing a very good job of work"—my italics. Does he know them all?

I do not have to be reminded that there are several grades of I.E.E. membership but since the letters a member appends to his name tell us what class he is in, I fail to see the point of this remark at all. Further I would say that no member of my acquaintance considers he is above reproach and I cannot remember having made any claim to this enviable distinction myself. The third paragraph of Lindsay Crawford's letter has been answered by the Editor—I am content.

In the fourth paragraph remarks are made which lead me to believe that the writer did not read my letter carefully—did I not say that any particular uncertificated engineer "may very well be the finest engineer in the country," and also "some uncertificated engineers are better and more capable at some jobs than some certificated engineers"?

To A.G.C. I would say as follows. A mountaineer who has scaled a difficult peak does not have to remain at the top in order to prove himself better than his companion who failed. If he has a companion who refuses to make the attempt yet claims to be a mountaineer, how can we possibly recognise him as such?

I will conclude by re-stating my principal belief—most certificated engineers are better than most uncertificated engineers at most jobs. How this can be denied or disputed I fail to see.

A.M.I.E.E.

LONDON

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IN my letter of May 3, the reference did not mean a person who was not entitled "by the grace of the I.E.E. Council" to write M.I.E.E., or A.M.I.E.E. etc. behind his name; but to the engineer who did not possess the Higher National Certificate.

A good portion of present members and associate members of the I.E.E., who are good engineers and holding "key jobs" in the industry did not take the examination, merely because they had not got the ability to do so, and I still contend that entry by thesis, as "A. N. Other" put it, is "childishly easy" to the average practical engineer.

The crux of the matter is that the I.E.E. council have made it impossible for the "practical technical engineer" to become a corporate member and therefore contrary to the earlier years when the major portion of I.E.E. members, the self same members who brought honour to the industry and the I.E.E., entered by virtue of their experience and engineering ability, and not the possession of a "scrap of paper."

I repeat, that the industry is supposed to be short of technical men of good training now, yet the I.E.E. Regulations concerning the class of Associates, states that every candidate for election or transfer to the class of Associate, shall be of good education and shall satisfy the Council that he is at least 28 years of age, that he has had at least five years experience in a responsible position as an electrical engineer, but this certainly does not apply to senior shift staffs, and are these not responsible engineers, making snap decisions, and organising manual staffs, without the supervision of their respective superintendants.

"Uncertificated Engineer"

LONDON

Trolleybus Tractive Resistance

Methods of deriving Accurate Curves

MANUFACTURERS of trolleybus electrical equipment who are members of the British Electrical and Allied Manufacturers Association have recently taken a valuable step towards standardisation by obtaining a correct trolleybus tractive resistance curve shown in Fig. 1. A comparison of the tractive resistance figures previously used by the different manufacturers in calculating vehicle performance revealed considerable divergence and it was found that very little test data on trolleybus tractive resistance was available.

As the actual value of tractive resistance greatly influences the performance of the vehicle, particularly the balancing speed, it is important that tendering companies should use accurate figures in order that the performance as shown by the calculated run curve can be obtained on the actual vehicles. It was, therefore, decided that all the companies concerned should combine to obtain tractive resistance curves from actual tests on trolleybuses.

It was realised at an early stage that no purpose would be served by making motoring tests as all the necessary results could be obtained more simply and more accurately from coasting runs.

Equipment Used

The first series of tests was undertaken at Hastings on a two-axle double-deck trolleybus. The reason for the choice of Hastings was the stretch of straight, well-made level road along the sea front.

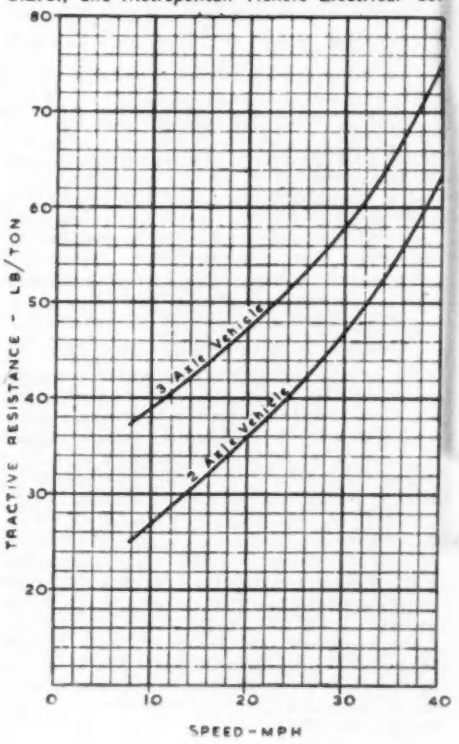
Three forms of recording instruments were used on these tests in order to compare and, if necessary, obtain average values of tractive resistance. These instruments were a two-element cathode ray oscillograph, a three-element Duddell oscillograph, and a paper strip recorder marked by means of intermittent sparks from two sparking coils. One spark was fired at equal intervals of distance covered by the trolleybus while the other was fired at equal intervals of time. Distance impulses for the recorders were provided by means of a "fifth wheel" apparatus towed behind the trolleybus. The variables recorded were speed, time and distance. Several runs were taken in each direction. There was no noticeable wind.

A great deal of work was done in analysing the results of this first series of tests and two main factors came to light in the process. First, the results obtained from the three recorders were remarkably consistent. Second, the Duddell instrument proved to be most useful, in that photographic records of comparatively long runs could be made whereas this did not prove possible with the cathode ray oscillograph or the paper strip recorder.

Three-axle Bus Results

The second series of tests was carried out in London on the L.T.E. system between Kingston Bridge and Hampton Court. A three-axle double-deck trolleybus was used for the tests. The Duddell recorder only was used in conjunction with a "fifth wheel" apparatus. The road was sensibly level and straight and the surface was good. Nevertheless a survey was taken and due allowance made for the gradients in calculating the coasting retardation

The graph shows the results of tests carried out by B.T.H., Crompton Parkinson, English Electric, G.E.C., and Metropolitan Vickers Electrical Co.



(a gradient of only 1 in 400 which is normally negligible in trolleybus work will introduce an error of over 5 lb/ton).

On plotting the tractive resistance figures obtained from the two series of tests as lb/ton against speed, it was seen that there was a large difference between the curves for the two-axle and three-axle trolleybuses, the latter curve being the higher. Probably the factor accounting for most of this was the difference in the losses of the gears and the effect of the extra rear axle.

Loss Analysis

The loss in the gears can be split up into gear face loss and oil churning loss. The former is a function of power transmitted whilst the latter is purely a function of speed. Thus the gear face loss is properly shown on the motor characteristic while the churning loss is obviously incorporated in the tractive resistance curve as it is a considerable drag on the trolleybus and is included in the resistance measured in coasting conditions. In view of the fact that the power taken in driving the motor during coasting is small the gear face loss is even smaller and can be neglected. The difference between the motoring tractive resistance and the coasting tractive resistance is the sum of the motor loss and the gear face loss. This additional loss is accounted for in the traction motor characteristic and should not be included in the motoring tractive resistance.

Though the tests were made only on double-deck trolley-buses, the curves obtained should in fact be applicable to single-deck trolley-buses. Since the frontal area of a single-deck bus is smaller than that of a double-deck type, the portion of the total resistance which is due to wind resistance will be less for the single-deck bus, which would give a slightly lower figure for the total tractive resistance in lb/ton.

As the gear loss has been divided in two, and the churning loss included in the tractive resistance curves, the gear face loss has to be included in the motor characteristic and is to be specified at 5% of the input to the gears. In motoring this will be the output from the motor and in rheostatic and regenerative braking the output from the axle or axles. For predicting the coasting retardation a figure of 0·4 m.p.h./s. should be used.

In conclusion the manufacturers wish to express their appreciation to the Hastings Tramways Company and the London Transport Executive for the loan of trolleybuses and depot facilities and to Birmingham City Transport for use of their "fifth wheel" apparatus.

METAL DETECTION

INTERESTING details of modern methods of metal detection in industry were given at the recent Manchester Electronics Exhibition in a paper read by MR. J. H. ETHERIDGE, GRADUATE I.E.E. (Cinema-Television Ltd.). The first part of this paper deals with the history and general principles of detection; of more immediate interest to power engineers are the descriptions of portable detectors for pipe and cable tracing and of fixed installations for dealing with tramp metal.

For pipe tracing, a simple mechanical oscillator of the vibrating reed type is used as an accessory, and is connected between the buried pipe and a true earth point as far distant as possible at right angles from the supposed route of the pipe. The detector is modified (by the turn of a switch) to become a straight amplifier with a single coil on the input and headphones on the output. With the coil parallel to the ground, the detector will pick up the oscillatory signal at all times except when it is immediately over the pipe. In quiet surroundings, pipes buried as deep as 200 ft can be traced in this manner, but in main roads this is reduced to about 30 ft. The depth of the pipe can be estimated by holding the detector at 45° to the surface and moving laterally: a second null point occurs when the distance moved is equal to the depth of the pipe.

For use in factories, detection equipment must have a high sensitivity, but this must be the same for all types of metal—both ferrous and non-ferrous. It must not need adjustment to balancing controls more than once in any 24 hours. In one form of the device an automatic balancing stage is incorporated to compensate for temperature drifts.

Search Head

The search head is of the three coil system—a central oscillator coil with two symmetrically placed pick-up coils in series-opposition. Products to be checked pass through the coil "window," and aperture sizes range from ½ in. dia. by 4 in. long to 8 ft long by 4 ft high. Use of the three coil search head reduces the effects of interference.

Frequency is important, as the higher this is the greater is the sensitivity to non-ferrous metals, particularly lead and solder; but if the frequency is too high the sensitivity to ferrous metals falls off and capacitance effects become troublesome. Frequencies above 10 kc/s are now used, and an electrostatic shield has to be provided over the head to eliminate such capacitance effects and to reduce radiation.

In the final sections of the paper the question of sensitivity—of indicating only what matters, whether it be 2 ft by 9 in. by 9 in. steel or ½ in. dia. metal spheres—is dealt with in some detail.

LOAD RESTRICTION

Load Spreading by Industry a Partial Answer Only

PLANT shortage amounting to 2,400 MW in a cold spell can be expected next winter, according to estimates presented by the B.E.A. to the Ministry of Labour's Joint Consultative Council for Electricity Sub-Committee. Based on this estimate, together with other evidence, the Sub-Committee's recommendations call for industry to reduce its maximum demand by 20% of last year's "unrestricted" value. Load spreading is the suggested method, the hours to which it should apply being 8 a.m. to 12 noon and 4 p.m. to 5.30 p.m. from the beginning of November to the end of March. The overall aim should be to reduce the national simultaneous maximum demand by 600 MW.

Other provisions of the recommendations are that no obstacle should be placed in the way of firms desiring to install auxiliary generating plant or to increase the use of such plant, and that large commercial consumers, with a load of 20 kW or over, should continue to be dealt with by Regional Boards for industry on the same basis as industry.

Scotland being better placed as regards plant, but being limited as to power export by transmission capacity, the restrictions are not to apply to industry there with the same severity.

B.E.A. Estimates

For the information of the Sub-Committee, the B.E.A. prepared estimates, as mentioned above, and these have been published with the main report. They begin with an appreciation of the position last winter, when the load met by available plant was 11,242 MW, while the reduction obtained by load shedding (cuts, voltage, and frequency reduction) was estimated at 2,215 MW. These figures give the estimated potential demand as 13,457 MW, and if 300 MW is allowed for the reduction effected by load spreading, the "unrestricted" demand becomes 13,757 MW.

In estimating the position for the coming winter, the Authority puts the "unrestricted" demand at winter peak as 13,800, 14,400, and 15,100 MW, for average, cold spell, and severe weather respectively. These figures appear to have a considerable margin of uncertainty. Turning to the supply side of the equation, a net gain in output capacity of 900 MW is hoped for—it is unlikely to be exceeded. Plant availability, taking into account the recent discouraging experience, is not put higher than 86% for December and January. These estimates are considered to give 12,000 MW for available plant capacity in December, rising to 12,200 MW in February.

Deficits for the winter on this basis come out at 1,800 MW for average weather conditions, increasing to 3,100 MW in severe weather. From this, it appears that, provided there is no further set-back in the commissioning, the position next winter can be expected to be very similar to the position last winter. To the extent that the Authority are successful in their drive to return generating plant more rapidly to service after maintenance, the severity of load shedding during October and November should be reduced.

It is estimated in the report that all figures refer to overall national conditions, and that circumstances in individual areas will vary considerably.

Background Figures

At the beginning of December last the installed capacity of the B.E.A. was 14,268 MW, and at the end of the month, 14,557 MW. By the end of June, installed capacity had increased to 14,733 MW, a net increase of 176 MW with 259 MW of new turbo-alternators commissioned. The corresponding boilers installed have a total evaporative capacity of 5,835 klb/hr, equivalent to, perhaps, 490 MW. Thus there must be heavy commissioning in the remaining months if the estimated 900 MW output capacity increase is to be obtained.

Although the report makes no specific mention of the load reduction achieved by allowing voltage and frequency to fall, the figures quoted suggest that it is between 7 and 8% of the "unrestricted" demand. The other variable of importance is the loss of output capacity due to breakdown, overhaul and unsuitable fuel, etc. In January, 1950, this was down to 11·4%, according to the B.E.A. Annual Report. Since 1% of output capacity is about 140 MW, any improvement on the January, 1951, figure of 15% will be most important.

Finally, there is the effect of any coal shortage that may occur to be considered. At the present time power-station coal stocks, at 4·56 m tons are 19% up on last year's, so the position this winter, with a plant increase of only about 7%, should be considerably easier.

Engineering at Edinburgh

Boiler Design, Hydro-electric Schemes and advances in Metallurgy, were discussed at Edinburgh during the British Association Meeting

FROM the opening meeting, with its exciting experiment in large-screen television technique, those attending the Festival Year meeting of the British Association at Edinburgh have had a busy week, particularly in the engineering section, which has had a particularly full programme before it. By the evening of the opening day, the registered membership for the meeting was 3,851, the highest for any provincial meeting.

Many of the sections had papers of interest to electrical engineers, but that most consistently of importance was, of course, Section G, Engineering, the president of which for this year is SIR CLAUDE GIBB, C.B.E., F.R.S. Sir Claude delivered his address to the section on Friday morning, extending somewhat the meeting's theme of 100 years' progress with a paper entitled "Two Thousand Years of Engineering."

Future Progress

The greater part of this survey makes a useful and interesting summary of progress, but need not be dealt with here. Of more immediate importance are his predictions of future developments. First amongst these he put railway electrification, in those countries where population and traffic density conditions permit this being carried out economically. Large-scale application of nuclear energy to the production of electrical energy might, he thought, increase this tendency.

Rational usage of "our greatest national asset —coal" is another subject in which advances are to be expected, and Sir Claude foresees high-pressure gas mains supplying heat to home and industry, the complete abolition of the open fire, the increased use of slow-combustion heating in homes, using coke or other residual fuels, gas turbines living up to their names and using gas, and the use of coke, gas or tar, and, of course, high ash-coal residues for generating electricity in central power stations.

While it is unlikely that any prime mover other than the steam turbine will be used for very large powers, the gas turbine is likely to a great extent to supplant the diesel engine.

On Thursday the section had before it four papers connected with electricity generation, the first two dealing with high-ash coals. The earlier of these was presented by DR. A. ALAN TAYLOR, PH.D., M.SC., F.INST.F., and entitled "The Use of High-ash Coals in the Electricity Supply Industry." The author tied his consideration of the problem to the subject of boiler availability, and he outlined the work that was carried out by the Boiler Availability Committee. Post-war conditions have made it necessary for high-ash coals to be used on existing boilers that were originally designed for much better fuels.

At the time when the problem of using high-ash coals began to be of major importance during the war, most power-station boilers were fitted with travelling grate stokers. The first problem with such coals is to burn them cleanly and efficiently, and the trouble here is that the air supply cannot be so easily controlled through different parts of the grate: a ragged fire may result, with some fuel still unburnt when it reaches the back of the furnace. Improvements can be effected by altering the quantity and distribution of secondary air and improving control of air through the grate.

Cleanliness of boiler surfaces first requires good combustion, with the flames kept as far as possible within the furnace, and not allowed to pass among the boilers and superheater tubes. It seems from experience that an important factor is to keep superheater tube metal temperatures as low as possible. Coal contents, particularly the amounts of sulphur, sodium or potassium, and phosphorus have a marked effect on boiler availability through the sticky and corrosive products they form. Boilers vary in their reaction to such effects, and troublesome coals are as far as possible segregated and burnt on boilers with a good record.

After all improvement that can be obtained in this way has been secured, troubles still remain, and quicker boiler cleaning is the main method of dealing with them. On-load soot blowers and the water lancing of bonded deposits on superheaters has proved effective and causes practically no damage. Off-load cleaning presents an entirely different problem, with thoroughness of cleaning, particularly of in-

accessible surfaces, an important factor. Gentle soaking in a steamy atmosphere may help to loosen deposits, or else a fine water spray may be used.

Some existing boilers have been modified to obtain better availability. In one successful case recirculation of about 10% of the flue gas through the furnace increased the boiler run from seven or eight weeks to six months. Air-heater corrosion or blockage has sometimes been overcome by reversing the air flow. Availability has improved, and the loss of efficiency that might have been expected has usually not occurred, because the surfaces stay cleaner.

Boiler Design

The boiler-maker's angle on the high-ash content problem was put by MR. W. G. MARSKELL, B.SC., F.INST.F. (Babcock & Wilcox), who began by considering coal cleaning and the whole problem of the mineral matter in the coal. Inherent mineral content is high in compounds containing sodium, potassium, calcium and iron, so that the resultant ash tends to have a low-fusion temperature. Ash formed from extraneous mineral matter, largely shale and similar materials having aluminium silicate as a principal component, has a high-fusion temperature. Changes in mining methods, and the lack of cleaning facilities, have increased the proportion of extraneous mineral matter, and the increased ash content of present-day coal supplies acts therefore mostly as an inert dilutent and special problems in the formation of fused slags and deposits are not involved.

For boilers with an evaporative capacity above 250 klb/hr, pulverised fuel firing is generally used, and the ash is reduced to a very fine powder, which is expensive to clean from the flue gates and is most difficult to dispose of. Mechanical grate stokers, while not presenting the same ash problem, introduce new trouble in the form of bonded deposits on boiler and superheater tubes. There are three zones of burning on a travelling grate stoker: ignition zone, where hydrocarbons are being distilled off, giving smoky gases above the bed and leaving incandescent coke; combustion zone, where the coke bed is burning; and burning-out zone, where the last part of the carbon is burnt from the ash before discharge. It is from the last two zones that the alkali metals forming the bonded deposits come off; mixing smoky gases with them has an ameliorating effect. In pulverised fuel firing, there is no segregation of the coal components in the combustion process, and the formation of bonded deposits is not a major problem.

In addition to bonded deposits, ordinary accumulations of partly fused slag form when the gas temperature in the vicinity is higher than the softening temperature of the ash particles in the gas stream. Cooling the gases before they enter the tube bank helps reduce deposits, and this is one of the reasons why modern boilers, compared with older designs are almost entirely water cooled and tall. Slag deposits on the furnace walls are unlikely to be troublesome.

Another development designed to avoid troublesome deposits in the arrangement of convection heating surfaces with comparatively wide gas passages, so that any deposits formed do not interfere so seriously with the flow of gas. Such designs, however, may increase the size and cost of the boiler very materially.

To increase the amount of ash kept in the boiler in large installations, the cyclone furnace has been introduced. In this, coal crushed to ¼-in. size is blown tangentially into a cylindrical water-cooled chamber. A very high rate of combustion is achieved, and the ash is turned to a molten slag which can be drained off. Cyclones, one or more for each boiler, discharge into a refractory-lined water-cooled primary furnace, and then into a secondary chamber that is very similar to the furnace of a normal pulverised full-fired boiler. Operating experience shows that cyclone firing retains some 90% of the ash in the furnace.

Finally, for boilers smaller than 250 klb/hr, spreader stoker firing is being tried. Rotating paddles on air jets throw coal into the furnace, and it burns uniformly over the whole grate area. Fine ash should be avoided, and bonded deposits should not be formed. The considerable amount of grit that is carried away from the furnace is readily caught by cyclone type grit arrestors.

Hydro-Electric Schemes

Water power was the subject of the remaining two papers presented on Tuesday, in the first of which Mr. T. A. L. PATON (Alex. Gibbs & Partners) dealt with modern trends in civil engineering applied to hydro-electric schemes. Water turbines for hydro-electric projects were discussed by MESSRS. R. W. WEEKES and A. FEINER (Harland Engineering), their paper dealing in particular with the layout of hydro-electric plant from the standpoint of turbine design. Many of the installations in Scotland were used as illustrations, and this theme so appropriate to a meeting in Edinburgh was continued on Monday morning, when MR.

T. LAWRIE (General Manager, N. of S. H.E. Board) read his paper "Electrical Aspects of Modern Hydro-Electric Development in Scotland".

Mr. Lawrie began by reviewing the effect of the Board's activities on the Highlands, and went on to list the installation programme as it stood at the beginning of this year—200 MW in operation, 229 MW under construction, 198 MW promoted and just starting construction, and 287 MW promoted or under survey. Sloy, with 130 MW is the largest individual station, whilst the largest machine planned so far is for Shira, a 40 MW vertical shaft Francis reaction machine operating under a head of 965 ft. Another interesting machine is the 30 MW horizontal alternator at Lawers; this is to be driven by two Pelton wheels operating under 1,362 ft head. Several Kaplan turbines are installed or on order, and the interesting point to note about these is that there coupled alternators must be designed to stand a possible run-away speed of two and a half times normal operating speed.

Power Cuts

Turning his attention to power cuts, the author first of all gave his opinion that saturation of demand was a long way distant. Plant required during the next ten years to overtake the present winter deficiency, meet the normal growth of load, and replace obsolete and worn out plant, he put at 20,000 MW for the British Isles—and this with power station construction taking up to seven years from planning to completion.

Nevertheless, the task can be successfully carried out. Turbine makers have stated that they can provide the B.E.A. with 2,000 MW of plant/year, and with steam power stations needing some 212 tons/steel per megawatt, steel requirements would still be only 2½% of the country's steel production even at the 2,000 MW/year rate. Hydro-electric development can help with even less demand on scarce materials, for each megawatt of capacity requires only 145 tons of steel, and the demand for skilled engineering labour is less because so much of the work demands the different skill of the civil engineering navvy.

Earlier in the morning, the problems of long distance high voltage transmission so often associated with the development of water power resources had been discussed by Mr. T. G. N. HALDANE (Merz and McLellan). Besides describing the engineering characteristics of many schemes, he dealt with the economies of transmission with direct reference to some important cases.

On Tuesday morning the Engineering Section combined with Section B, Chemistry, in a joint meeting at which four authors presented papers. DR. F. D. RICHARDSON (Imperial College) considered the chemistry of metal extraction and discussed especially reactions between slags and metals. Dealing with fundamental researches on the thermodynamics of gas-slag systems, the author suggested that it may become possible to make lower sulphur pig iron by mixing slag and metal in the ladle after tapping, and also to recover the sulphur present in the molten slag by blowing air or oxygen through it. Although only 1 to 2% of oxygen is present, it is readily evolved as sulphur dioxide, which could be used for the production of sulphuric acid. The seven million tons of blast furnace slag made annually in Britain are thus a potential source of 100,000 tons of sulphur.

Recent Alloys

Later, at the same session, Professor A. G. QUARRELL (Sheffield University) described some recent metals and alloys. He pointed out that although the last few years have seen vast strides in the understanding of the theory of alloys, those alloys which are most important technically are extremely complex, and industrial practice still outstrips theoretical understanding.

Dealing with alloys, for use at high temperatures, the professor suggested that the story was one of steady improvement of known alloys. Austenite steels, particularly an alloy containing nickel, chromium, cobalt, tungsten, molybdenum and columbium have given successful service as gas turbine discs under conditions of high stress and high temperature. Ferritic steels have been continuously improved and there are now alloys with creep and scaling resistance almost approaching those of the austenitic steels, and much more economical because of lower alloy contents.

Cast iron properties have been considerably improved by the addition of small amounts of cerium or magnesium. This causes the graphite to solidify in nodular instead of flake form, and the mechanical properties are comparable with those of steel.

From amongst the many other activities of the packed programme, there is room only for mention of one visit—that to Portobello power station. Here visitors were able to see experiments proceeding on the Field cycle. Large scale compression with steam in a supersaturated condition is involved in this cycle, and a small wet steam compressor rig is being installed at the station to carry out fundamental research work.

Problems and Practice IN ENGINEERING

Commissioning Trouble

WHEN commissioning new equipment there is always an air of excitement when first switching on, and a feeling of relief if the circuit-breaker stays in and no smoke is observed. On one occasion when I was commissioning a 300 kW high voltage rectifier equipment, the breaker did *not* stay in, nor yet was any smoke noticed, in fact everything appeared normal except that the circuit-breaker tripped immediately. Suspecting faulty latching of the breaker I had this inspected and tested with the truck out, and in this condition it certainly latched home satisfactorily.

A second attempt was made to close the circuit-breaker and this time it stayed in but the ammeter in the transformer primary circuit was reading about half full load with the secondary open circuited. The circuit-breaker was tripped by hand as quickly as possible, as there was obviously something very much wrong with the transformer.

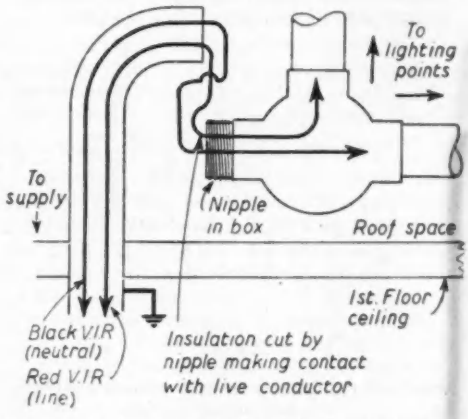
A 400 V 3-phase supply was available and this was connected to the 11,000 V primary of the transformer, and the secondary voltages measured. All the latter were balanced but all appeared to be about twice normal in magnitude. Closer investigation revealed the factor $\sqrt{3}$ entering into the calculations, and this, together with memories of Test Department tricks, gave me the clue to the trouble.

The transformer had been tested on a 6,600 V alternator and Test Department had omitted to reconnect it from delta to star.—*E. M. W.*

Earth Each End

SHOCKS were being received from conduit carrying lighting cables in the roof space of a two storey private residence. The writer was called to investigate and found that a p.d. of 235 V existed between the conduit and "earth," this voltage being also recorded at the point of supply. Defective "earth continuity" of the conduit was suspected and on investigation, this proved to be the case.

The incoming conduit in the roof terminated in a three-way box, and conduit being fed out to the various lighting points. The incoming conduit had been severed at the box, completely isolating from "earth" the box and outgoing conduits therefrom, and the box had



Discontinuity in conduit at 3-way box in roof space

trapped the v.i.r. cables cutting through the insulation to the "live" conductor.

Had the conduit been earthed at its extremity, i.e. in the roof space—this dangerous situation would not have arisen; the fuses would, of course, have "blown."

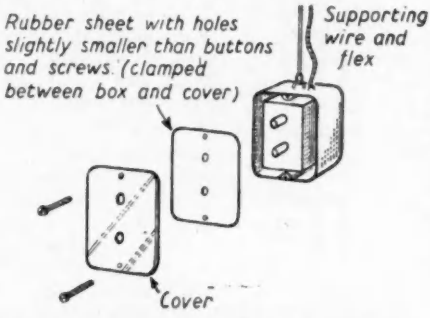
In the writer's opinion it is essential to bond conduit to earth at the top and bottom of an installation.—*R. H. G. Holloway.*

Uncertain Earthing

I WAS recently called upon to investigate a complaint of shocks being received from a crane in a constructional steel-workers' stockyard. The crane was operated from ground level by means of push buttons, housed in die-cast metal boxes suspended from the crane. It was from these that the shocks were obtained.

A preliminary check was first made of the main earthing arrangements, which proved to be in order. Attention was then paid to the push-button controls, as I thought that there might have been a break in the earth wire to one of the metal boxes. A test with an ohmmeter proved that this was not so, as perfect continuity showed in each case.

Nevertheless, all was not well within the push-button boxes. Watertight cable entry glands had been carefully fitted by the makers, but the buttons simply projected through holes in the cover ! Rain had inevitably entered and the bakelite moulding carrying the contacts was quite wet, allowing surface leakage to take place. This did not explain why shocks were felt, however, if the earthing was efficient. The push-button boxes were bonded to the crab. Earthing continuity was then made through the crab wheels and gantry rails, gantry wheels and bridge rails, to the main earth connection.


Rubber sheet with holes slightly smaller than buttons and screws (clamped between box and cover)
Supporting wire and flex
Cover

Application of rubber shields to prevent ingress of moisture to push-buttons

Here was a clue. The crane was out of doors (in the stockyard) and the rails were rusty ! The ohmmeter was next connected between the crab and the gantry rails. A test made while the crab was moving caused the meter pointer to move erratically up and down the scale. Spot readings taken with the crab in different positions showed resistance values ranging from zero up to 500 ohms. Quite a high figure when it is remembered that it represents the contact resistance of four wheels in parallel.

The only thing to do seemed to be to fit earth wires and collector shoes along with the current supply wires. It was suggested that pieces of sheet rubber be fitted to the push-button boxes (as shown in diagram) to prevent ingress of moisture.

Fortunately the shocks that had been felt were not very severe and no one had been hurt; but the consequences may have been more serious if anyone had attempted to climb on to the gantry. Access was by means of a ladder up one of the stanchions supporting the bridge rails, and even a slight shock felt when taking hold of the gantry may have been sufficient to make a man release his hold and fall to the ground.—*J. G.*

Pulveriser Problem

THE operator of a large coal pulveriser reported that after running a load for about five minutes the ammeter reading would rise abruptly and the main circuit breaker trip out. This was happening repeatedly and was most unusual although flushes of coal from the hopper are a frequent cause of tripping. As the operator's post is distant from the pulveriser I decided to stand by the machine and note events. The pulveriser is driven by a 40 h.p. slip-ring motor via six short Vee belts and everything was cool and in good order. As reported, after a few minutes the ammeter rose viciously and out went the main breaker, this being repeated after every restart. Numerous tests failed to show the fault which was eventually traced to the simplest of all: slipping belts! As the machine has such a large "fly-wheel" drive there was no audible indication of the change in speed. I should add that as the pulveriser had to be cleaned out after every stoppage this just gave the belts time to cool off so that they did not "grab hold" until the pulveriser had been running a few minutes.—*A. R., Chesterfield.*

Irons and Earthing

A COMPLAINT was received that a domestic iron would not work from one switch socket outlet and would only work occasionally from another socket, whilst other apparatus worked satisfactorily from both sockets.

A megger test on the iron showed a fault to earth from one contact and an open circuit between the two contacts. On dismantling the iron it was discovered that near one contact a break had occurred in the element and that one side of the break had earthed to the casing through a fracture in the mica insulation.

The explanation of the intermittent operation from one socket can be readily seen, for when the positive terminal of the iron adaptor was plugged into the lefthand contact nine-tenths of the element would operate to earth, and an open circuit existed when the adaptor was plugged in the reverse direction. A further test on the socket from which the iron would not operate showed the non-existence of earth continuity on the third pin, hence an open circuit occurred whichever way the adaptor was plugged in.—*P. A. Bull.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

Diesels for Ceylon

Eight New Locomotives for the Government Railways

EIGHT new diesel-electric shunting and freight locos have been designed for the Ceylon Government Railways. These have been completed at the Queen's Park Works of the North British Locomotive Co., Glasgow, and are powered with Paxman 625 h.p. standard railway traction engines driving General Electric Co's generators. G.E.C. also supplied the control equipment and the traction motors.

As can be seen from the illustration, the locomotive is carried on two four-wheel bogies, each axle being driven through gearing by a nose-suspended motor.

Power Unit

The diesel engine and main generator, with overhung auxiliary generator, are mounted on a lightweight welded underbed, supported on the main frame at four points. The diesel engine itself is a Vee-type, 12-cylinder, Mark 12, RPHX unit, with a 7 in. bore and 7¾ in. stroke, fitted with Brown-Boveri gas superchargers. An output of 625 b.h.p. at 1,250 r.p.m. with b.m.e.p. of 110 lb/sq in. is attainable.

Engine speed is governed by a centrifugal hydraulic servo-governor driven by bevel gearing from the end of the camshaft. In addition to controlling the fuel supply, the governor is linked to a valve, which controls the oil supply to the servo-motor of the automatic load-control rheostat. Pneumatic control enables the governor to be set to give eight speeds.

Main and auxiliary generators have been built as one compact unit, with special attention to providing maximum accessibility in a design suitable for installation in a confined space. Excitation for the main series winding of the main generator is provided by the auxiliary generator, no separate exciter being employed. In addition, the main generator has a self-excited winding to assist the externally excited field, a series winding to give a drooping characteristic to the generator output and to limit the maximum current, and a starting winding to enable the generator to be motored from the battery for starting the diesel-engine.

Control

Although twelve notches are fitted to the controller, under normal working conditions only nine will be used. The general control of the engine is automatic, and constant loading is obtained through adjustment of the main generator field by means of an oil operated rheostat under control of the engine governor. This system prevents over-loading of the engine, and in effect provides the equivalent of an infinitely variable gear between the engine and wheels.

The auxiliary generator, rated at 25 kW has an output at 110 V and supplies all auxiliaries, battery charging and control circuits. Voltage is maintained, within ± 3% by a carbon-pile voltage regulator.

In the driver's cab are the master controller and the two brake valves. Controls are duplicated to allow for either side working, and thus two "deadman's" pedals are fitted. A time delay in the operation of these pedals enables the driver to move from one position to another without stopping the locomotive.

Side view of one of the North British Loco Co./G.E.C./Paxman diesel-electric locomotives

overseas news

Power Ship Quest

The New South Wales Government is considering the purchase of a cheaper power ship than the one first proposed (see the ELECTRICAL TIMES, July 26), the Deputy Electricity Commissioner, Mr. V. J. F. Brain, stated a few days ago. The first proposal was to have two 10,000 kW generators installed in a self-propelled Liberty ship hull, costing in all, about £2,500,000. Mr. Brain has said that a non-propelled hull was now being considered—it would be more economical and more suitable for installing the plant, but it would have to be towed from America. Two similar units have been in service in the U.S. for several years, he said. Mr. H. G. Conde, the Electricity Commissioner, recently paid a return visit to America.

N.S.W. Line Contract

A contract for the erection of a main transmission line to link the State's Metropolitan and Southern Electricity areas, has been placed with an Italian firm, the Societa Anonima Elettrificazione, of Milan, by the Electricity Commission of New South Wales. The value of the contract is stated to be over £1,000,000.

Financial Stringency?

The State Electricity Commission of Victoria has floated another public loan, of £6,000,000 at 3½% for a term of 10 years, to finance new works. But the Commission now has fears that the remaining £48,000,000 spending programme for this year may have to be pruned, although Mr. R. A. Hunt, chairman of the Commission has said it would be disastrous if the Commission's construction programme were curtailed because of lack of finance. There could be no half measures with today's serious power and fuel shortage. More power was an urgent defence necessity.

The Commission's spending programme includes: £17 million on the greater Yallourn Station and other power stations; £15½ million on the Morwell briquette project, and £8 million on the Kiewa hydro-electric project.

Osborne Expansion

The Electricity Trust of South Australia planned to spend up to £30 million in the next four years to expand services in the State, declared the Premier, Mr. Playford, last month when inspecting a new boiler at Osborne "B" power station which is burning Leigh Creek coal exclusively. The boiler is equipped with a spreader type stoker. Future plans of the Trust provide for the installation of 12 new boilers and 6 turbo alternators. Eight of the boilers were for Osborne and four for Port Augusta. The installed capacity at Osborne now is 139 MW.

Toronto Results

In Toronto, power consumption increased sharply last year, the annual report of the Toronto Hydro Electric system shows. Units sold increased by over 216 millions to 1,915 millions, and the peak load rose by 75,000 kW to 420,203 kW. The financial statement for 1950 shows a net income of $53,552 which was transferred to the reserve for stabilization of rates. Gross operating income for the year was $19,679,388. The system bought power from the Hydro Electric Power commission of Ontario at $33.10 per kilowatt, then was advised at the end of the year that the cost to the Ontario commission has been £31.07. The sum of £1,600,000 has been appropriated for the reserve for frequency standardization. With the construction of a 20 MW 60-cycle steam station at Ashbridge's Bay, and further terminal stations, the total load supplied in the city at that frequency amounted to 1,033 kW at December 31 last. Reference is also made to the retirement in May last of Mr. E. M. Ashworth. His successor as general manager is Mr. H. J. MacTavish.

B.C. Wants Plant

The British Columbia Power Commission has announced that heavy equipment for its $4,000,000 addition to the Joho Hart development at Campbell River, giving the plant a 56,000-horse-power increase, will be purchased immediately. H. G. Acres and Co. are drawing up plans and specifications for generating units five and six, each of 28,000 h.p., to be installed by the end of 1952. Meanwhile, work is proceeding on the installation of a power line to the substation at Duncan Bay, to serve the £40,000 development of the Elk Falls Co., biggest of the island's pulp and paper enterprises.

Alberta Investigation

The Alberta Power Commission and Calgary Power Ltd., co-operating on surveys of possible hydro-electric power development, are currently engaged in aerial and ground studies at a potential site at Grand Rapids on the Athabaska River which would utilise Lesser Slave Lake, covering an area of almost 500 square miles, for storage purposes. Under survey is a 180-mile area. The government hopes Grand Rapids will be the answer to tremendous load growth in the province.

Supply Priority Problem

Having operated a "new connections on the basis of priority" procedure for sometime, the Ahmedabad Electricity Co. Ltd. has decided that the system has caused unnecessary delay and waste of labour. With thousands on its waiting list, the management has hit upon the idea of combining the principles of priority and area with supply of power, so that men and materials are concentrated in a particular area till all connections there are dealt with. To avoid complaints of undue preference in the selection of areas, the company suggested the ballot system. Now that the Government has given approval to the proposals, the company expects to connect 150 more consumers per month under the new plan than before. Till now, half the undertaking's working days were wasted in moving men and equipment to various parts of the city. The new method will also provide the company with a reasonable estimate of load requirements.

New Station

The Government of East Pakistan is soon to set up a power station at Siddhirganj (about 8 miles from Narayanganj), from where power will be supplied to the Narayanganj town and nearby industrial areas.

Guarantee Claim Upheld

In a recent test case in New Zealand, the local electricity undertaking for the Rotorua district, claimed £19 18s. 4d. from a sheep farmer, that sum being the difference between the £30 annual guarantee made by the defendant and the actual amount he had paid for power used. The defendant contended that the impositioning of a rationing quota by the undertaking amounted to a novation, therefore the obligation to charge the minimum guarantee should cease to apply. The power restrictions had made it impossible for him to use £30 worth of electricity annually, the defendant claimed. Giving judgment for the electricity undertaking, it was held that the supply agreement standing alone created an obligation to the undertaking to supply the defendant with any amount of power which he may require. Under it the defendant was also obliged to pay £30 to the authority on actual charges prescribed, whichever was the greater. If, therefore, the authority failed to supply all the power needed, he would be entitled, in certain circumstances to repudiate the agreement and recover by way of damages, any loss suffered. But the 1945 Act and the 1949 Statute Amendment Act, was a bar to any such action at the present time, the magistrate declared.

Geothermic Optimism

In his recent address to the New Zealand Power Boards' and Supply Authorities Association, Mr. C. J. Lovegrove, the president, made an optimistic forecast for the future production of electricity in the Dominion. Referring to geothermic generation he said the experimental geothermal bores at Wairakei were already producing better results than those at Lardarello in the Tuscany hills of Italy, where geothermal electricity was being generated. Although the Government was being cautious about its predictions based on the geothermal experiments, he knew they had great expectations. The Electricity Controller, Mr. A. E. Davenport, had told him that the deeper the department was boring at Wairakei the hotter the steam was becoming. Cabinet had recently authorised a substantial grant for improved apparatus for driving bores. After his visit to Lardarello, said Mr. Lovegrove, he had come away a convert to the geothermal scheme for generation. He felt now that the Government would be failing in its duty if it did not do everything in its power to explore with expedition the possibilities of generating geothermal power in New Zealand.

Power Wanted

The first power station in South Africa intended primarily for farm electrification is the objective of a new movement in the Transvaal lowveld. The Union is stated to be at present one of the most backward countries in the world for rural electrification. But this is not surprising considering the sparseness of population and the small power demands of farmers. An enthusiastic meeting of farmers, miners and others met at Malelane a few days ago and elected a committee to prepare a detailed case for the Electricity Supply Commission and to "press the matter with utmost vigour."

Plant for Bloemfontein

A £650,000 contract for plant for Bloemfontein's new power station has been placed with International Combustion Ltd., through its South African associated concern. The order is for boilers and stokers, for delivery in 1953-54, we understand.

Egypt's Railways

In its budget estimates for the forthcoming year, the Egyptian State Railways has allocated a credit of £E200,000 to begin the electrification of the Helwan line. The whole plan will cost approximately £1,500,000.

Uruguay Plan

A scheme to utilise the falls of the River Uruguay north of Salto has been under consideration since 1945 by a commission of Argentine and Uruguayan engineers. The Uruguayan committee have now recommended proceeding with a definite plan. They suggest that the best site for the proposed dam would by Ayui, about nine miles north of Salto. At this spot the dam would be 2,800 yds long, to form a lake of nearly 200 square miles. The power station could house 20 turbines, each of 70,000 kW capacity.

PERSONALITIES

IN THE INDUSTRY

His many friends in the lighting industry will be interested to learn that **Mr. P. S. Barton,** F.I.E.S., who has been general sales manager of Courtney, Pope (Electrical), Ltd., for the past two years, has decided to settle in New Zealand, and is sailing for Auckland in the *Moreton Bay* on September 21. Before joining Courtney, Pope in 1949, Mr. Barton had spent nearly 20 years with Benjamin Electric Ltd. He is a Fellow of the Incorporated Sales Managers Association, having been hon. treasurer of the London branch and a member of the Council for a number of years. We understand that he already has a number of agencies from British manufacturers who wish to increase their exports to New Zealand, but would, no doubt, be interested in other non-competitive lines. Any concern interested may contact him at 43 Quakers Road, Potters Bar, Middlesex.

Mr. P. S. Barton

Mr. N. C. Williams, formerly electrical manager with Harland and Wolff Ltd. at Southampton has been appointed electrical superintendent of the Overseas Tankship Corporation (U.K.) Ltd., in London. He is succeeded at Southampton by **Mr. Ian Austin,** formerly assistant electrical manager with Harland and Wolff at Belfast.

Several new appointments and re-appointments to the North of Scotland Hydro-Electric Board have been made by the Secretary of State for Scotland and the Minister of Fuel and Power. **Mr. Tom Johnston,** P.C., LL.D., J.P., F.E.I.S., the present chairman, and **Mr. Neil S. Beaton,** whose current terms of office expire in September, have been reappointed for a further period, and **Sir Hugh Mackenzie,** C.B.E., at present a member, has been appointed deputy chairman in place of the late Sir Edward MacColl. Three new members have also been appointed as from September 1. These are **Mr. E. S. Harrison,** ex-Provost of Elgin, a director of James Johnston and Co., cloth manufacturers, Elgin, and at one time chairman of the Local Authorities Hydro-Electric Committee; **Mr. W. Leonard,** formerly Labour M.P. for the St. Rollox Division of Glasgow, and a member of the General Council and former president of the Scottish T.U.C.; and **Mr. A. I. Mackenzie,** C.A., a partner of Brown, Fleming and Murray, C.A., Glasgow. All the members of the board, including the chairman and deputy chairman, will, in future, serve on a part-time basis.

Mr. W. R. Herod has tendered his resignation as a director of Associated Electrical Industries Ltd., as he feels that as a co-ordinator of the North Atlantic Defence Programme it is inappropriate for him to have business contacts with companies with whom he may be in relation in his official capacity. The Board of A.E.I. have accepted Mr. Herod's resignation with deep regret, and wish to record their lasting gratitude for the great services which he has rendered to the company.

It is announced that **Dr. W. G. Radley,** C.B.E., B.SC. (ENG.), PH.D., M.I.E.E., at present deputy engineer-in-chief, General Post Office, is to succeed **Sir Archibald Gill,** B.SC.(ENG.), M.I.E.E., F.I.R.E., who is retiring, as engineer-in-chief on October 1 next. Born at Birmingham, Dr. Radley was educated at Leeds Modern School, and gained technical education at Faraday House. After a period of training with Bruce Peebles and Co., Ltd., he entered the G.P.O. as assistant engineer in 1922, and has since been prominently associated with the Research Branch, much of his early work being in connection with interference between power and communication circuits. He is also

Dr. W. G. Radley

Sir Archibald Gill

controller of research of the Post Office Engineering Department. He is a past chairman of the I.E.E. Measurements Section, and was this year elected a vice-president of the Institution. Sir Archibald Gill, who is retiring at the end of September, has spent a lifetime of service with the G.P.O., apart from early training with Yarrow and Co., Ltd., and a short period with the B.T.H. Co., by whom he was employed in the designing of steam turbines. He entered the Post Office Engineering Department in 1913, being then attached to the Radio Section. He was appointed executive engineer in charge of the Radio Experimental Section at Dollis Hill in 1925, and became an assistant staff engineer in 1929. Later promoted to staff engineer of the Radio Branch, and deputy engineer-in-chief, he succeeded Sir Stanley Angwin as engineer-in-chief early in 1947.

To succeed **Mr. W. G. Edwards,** who has retired, the British Broadcasting Corporation has appointed **Mr. G. Stannard,** A.M.I.E.E., as assistant superintendent engineer, lines. Mr. Stannard joined the operations and maintenance department of the B.B.C. in 1932 and was transferred in 1935 to the lines department. In 1947 he joined the newly formed design department, where he has since been engaged on the design of equipment associated with the G.P.O. line networks that link the B.B.C.'s studio centres and transmitting stations. The B.B.C. has also announced that **Mr. R. C. Patrick,** Associate I.E.E., has been appointed assistant superintendent engineer recording. Mr. Patrick joined the research department in 1925 and has since had experience in a number of other departments of the engineering division. During the war he was assistant engineer-in-charge at the B.B.C.'s emergency headquarters and later became senior assistant to the superintendent engineer recording.

Until recently London area manager of Ferranti Ltd., **Mr. R. M. I. Hobill** has been promoted to home sales manager of that company, and will henceforth operate from Hollinwood. He is succeeded in the position of London area manager by **Mr. W. D. H. Gregson** who was in charge of sales at the firm's Edinburgh works.

The Sloan Electrical Co., Ltd., announce that **Mr. E. H. Maltby** has been appointed general manager of the company. He has had considerable experience in the electrical wholesaling business, having originally joined that concern in 1934 as sales engineer in the London area, and, apart from five years spent with the R.A.C. in the last war, served in that capacity until his appointment as sales manager of the company in February, last year.

Mr. E. H. Maltby

Mr. A. J. Bourne, who has been connected with the Birmingham copper and brass firm of Earle, Bourne and Co., Ltd., since 1908, and for the past 27 years has been works manager, has been elected a director of the company.

Following the death of Mr. Charles White, noted in our July 26 issue, his partner, **Mr. F. Chapman** is now carrying on the electrical wholesaler's business of Charles White (London) Ltd. under the same title.

Mr. James D. D. Shaw has been elected to the board of Duncan Watson (Electrical Engineers), Ltd. Mr. Shaw is managing director of the Scottish electrical contracting concern, James Kilpatrick & Son, Ltd.

The South Western Electricity Board announce the appointment of **Mr. W. Hucker,** a former journalist, as information officer. **Mr. B. G. Murray,** who has been the Board's information officer since November 1948, is taking up an appointment in the commercial policy section at the Board's head office in Bristol.

Councillor H. T. Bush, J.P., C.C., of Cheltenham, **Alderman W. Nevill,** O.B.E., J.P., of Walsall, **Mrs. G. E. Crabtree,** J.P., of Little Aston, and **Mrs. M. Jacob,** of Lichfield, have been appointed to be members of the Midlands Electricity Consultative Council. **Mrs. B. M. Cully,** B.A., of Cheltenham, has resigned from the Council on going abroad. **Alderman A. Jones,** of Tipton, **Alderman A. L. Garratt,** J.P., of Lichfield, have resigned for health and business reasons respectively. **Mrs. K. M. Garrard,** of Sutton Coldfield, is no longer able to attend the council meetings and has relinquished her appointment.

Dr. Edward Condon last week resigned as director of the American Bureau of Standards, because, he stated, "he could no longer afford to accept the severe financial sacrifice involved." (His government salary was $14,000 a year.). Dr. Condon is leaving to become director of research at the Corning Glass Co.'s laboratories, New York. He was director of research at the Westinghouse Electric Corporation before entering government service in 1945.

The wedding took place on August 4, of **Mr. R. C. Hull** (jun), director of the Universal Electrical Co. and **Miss B. Gibbs.** Mr. Hull, junr., is the eldest son of R. C. Hull, a founder member of the Association of Electrical Machinery Traders.

Mr. L. Bentley Jones

Mr. L. Bentley Jones has been elected a director of Thorn Electrical Industries, Ltd. He is in charge of the Ferguson Radio and T.V. Division.

Previously sub-area engineer for the South Staffs and North Worcs. sub-area of the Midlands Electricity Board, **Mr. R. A. York,** B.SC., A.M.I.E.E., has been appointed chief assistant engineer at the Board's headquarters at Halesowen. Mr. York replaces Mr. R. Mallet, who, as already announced has become manager of the Worcs. and District sub-area of the Board. Prior to vesting day, Mr. York held various appointments with the Midland Electric Corporation for Power Distribution Ltd.

Officials and staff of the South Shields offices of the North Eastern Electricity Board have presented an inscribed gold watch to **Mr. G. H. Dale,** the local district engineer, to mark his retirement after 31 years' service in the area. The presentation was made by Mr. E. C. Lennox, manager of the Board's Wear sub-area.

Until recently power adviser, Land Nordrhein-Westfalen, under the Foreign Office (German Section), **Mr. J. F. Elphick,** A.M.I.E.E., M.Amer.I.E.E., has been nominated overseas liaison engineer with the British Electricity Authority. Before joining the Power Division of the Control Commission in September, 1945, he had gained 15 years' experience in England on operation, testing, repair and maintenance of generating plant and equipment, and 9 years on transmission and distribution. A large part of this time was spent with the City of Winchester Electricity Department. Educated at Bexhill College and Eastbourne Technical Institute, his early practical training was received with the Bexhill Corporation Electricity Department.

Mr. W. G. S. Bond, A.S.A.A., an assistant chief accountant with the B.E.A., has been appointed a deputy chief accountant to the Authority, in succession to **Mr. F. H. Grigsby,** O.B.E., F.S.S., who has retired on reaching superannuation age. Prior to nationalisation, Mr. Bond had been with Edmundsons Electricity Corporation Ltd. since 1941, having earlier served for 25 years with Annan, Dexter and Co., during the latter part of which he specialised in the audits of electricity undertakings. Mr. Grigsby had been with the Central Electricity Board since its inception in 1927, and for 21 years was in charge of the Internal Accounts, Cash and Capital Branch.

OBITUARY

The electrical contracting industry has lost another of its pioneers by the death on August 8 of **Mr. E. J. Page,** M.I.E.E., director of Page and Miles, Ltd., the well-known electrical engineers and contractors on the South Coast. He started his career as an ironmonger's assistant, but later worked in Brighton's first generating station operated by the Robert Hammond Company. Foreseeing the development in electrical installation work, he founded, in 1888, with Mr. H. J. Miles, the firm of Page and Miles, at Brighton, and was responsible for installing the first electrical equipment in most of the large buildings in the district.

Mr. J. Mann, chairman and managing director of the Power Flexible Tubing Co., Ltd., which he founded, died on August 9, aged 70.

Mr. P. S. Simpson, late telecommunication controller, Scottish Region, G.P.O., died on August 4.

Mr. N. Fyfe, chief architect to the British Aluminium Co., Ltd., died on August 4.

Mr. W. Shearer, who retired in 1937 from the position of chief cashier and accountant to C. A. Parsons and Co., Ltd., died recently at Newcastle.

Will.—Mr. J. Meech, A.M.I.E.E., chairman, joint managing director and founder of Meech Electric Drives, Ltd., left £27,542. (£26,976 net value.)

BRITISH STANDARDS

Overhead Line-wire Material (Non-Ferrous) for Telegraph and Telephone Purposes. *B.S.* 174 *to* 181: 1951. *Price* 4*s*. In the latest revision of B.S. 174-181, "Overhead line-wire material (non-ferrous) for telegraph and telephone purposes," a few minor amendments and corrections have been included to meet the changes which have taken place in the industry since the last revision of the standards in 1938. No major alterations have been made, but the specification for bronze wire has been omitted in view of the very small demand which is now made for that material. These eight combined British standards specify the material, dimensions and quality of hard-drawn copper wire and cadmium-copper wire, and of copper binding and jointing wire. They also cover copper and cadmium-copper for telegraph and telephone purposes, tapes, binders and sleeves, and prescribe mechanical and electrical test, together with requirements for packing.

British Association (B.A.) Screw Threads. *B.S.93, 1951. Price 3s.* There are now two classes of fit for B.A. screw threads, sizes 0 B.A. to 10 B.A. In order to facilitate the economic production of small commercial bolts, screws and nuts, this revision of the 1919 edition provides a 'normal' series having increased bolt and nut tolerances for sizes 0 B.A. to 16 B.A., and affords an allowance, for ease of assembly or for plating, between the maximum bolt and minimum nut sizes. The bolt tolerances included in the previous edition now form a 'close' class for more precise engineering, for sizes 0 B.A. to 10 B.A. There is a single series for nuts, this having the increased tolerances. Complete tables are given of basic sizes for sizes from 0 B.A. to 25 B.A. The specification also includes a recommended gauging system. The main tables are presented in metric dimensions and an appendix repeats the tables in approximate inch equivalents. Other appendices give useful data on the form of the B.A. thread and the basis of B.A. sizes, allowances and tolerances.

Motors for battery-operated vehicles *B.S.* 1727 : 1951 *Price* 3*s*. This standard covers the classification, rating and method of test for d.c. electric motors forming part of the equipment of battery-operated road vehicles, industrial trucks and tractors, but does not apply to rail vehicles. The specification gives details of types of motor, temperature tests, over-speed tests, commutation tests, high voltage tests, efficiency, characteristic curves and performance and type tests. The Appendices include classification of insulating materials, methods of determining efficiency, terminal markings and recommended limits of temperature in service.

Copies of these Standards are obtainable from the B.S.I. 28 Victoria Street, S.W.1, at the prices stated.

Power and Rural England

Silver Jubilee report of Council for the Preservation of Rural England shows continued vigilance

"THE C.P.R.E. would, of course, like l.t. distribution to be underground wherever possible, but it is appreciated that the problem is essentially an economic one, and that too great an insistence on this would delay supplies to many rural consumers." This extract from the annual report of the Council for the Preservation of Rural England is typical of the sane approach to safeguarding our national assets yet encouraging and assisting progress which has been a virtue of the organisation during its 25 years of existence.

In the silver jubilee report the council reaffirm their desire to see a speed-up in the distribution of electricity in rural areas, and welcome the associate membership of many of the area boards.

Tariffs and Rural Supplies

In reference to the extension of supplies into the rural areas the council state that in their opinion the charges for electricity in these areas should not exceed rates prevailing in urban quarters and in the cities. They feel that now the industry has been nationalised the cost of providing power throughout the country should be shared evenly; that the farmer and his kind should not be penalised because of comparative isolation due to the nature of their work.

Distribution

It is perhaps in these matters that the voice of C.P.R.E. is most consistently and loudly heard. Reference is made to the opposition by the council to the proposed Malvern Hills line of the Midlands Board and B.E.A.'s proposed 275 kV Newcastle-on-Tyne (Stella) to Carlisle line. In this reference the council maintains that where a grid line is the subject of objections no proper judgment can of necessity choose that alignment which is cheapest and shortest at the expense of other national interests involved.

Medium voltage lines have also come under review by the council. Evidence of different approaches to the problem by the pre-1947 supply undertakings is to be found. The County Planning Officer for West Sussex is quoted as stating that the distribution of electricity of the past 30 years has been allowed to proceed with very little control, the need for power being the paramount consideration, with deplorable results to the amenities of small hamlets and villages. The council feels that it is often possible to route overhead lines so that the poles are screened and the line broken against a natural background. Emphasising their considered opinion that the industry should be prepared to use underground cable the council express concern "that there is so far little evidence of willingness on the part of the distribution authorities . . ." Some success is reported in this field however; an example is the half-mile underground route in the Brathay Valley in the Lake District.

The other side of pre-vesting day affairs was illustrated in the record of many miles of cable being laid underground before the war in Lunesdale and Lancaster districts. In Lancashire joint inspection of proposed new routes is carried out by a C.P.R.E. representative, officials of the Divisional Planning Committees and of the Area Board with, the council say, generally satisfactory results. This method is recommended by the council as a means to end much of the conflict at the present time.

Other lines mentioned as interesting the council are the Lindscale–Roosecote 132 kV line where modifications were suggested and in part accepted, and the line affecting the Monks Meeting House at Corsham, Wilts, in which matter C.P.R.E. headquarters is lending support to the local branch.

Hydro-Electric and Wind Power

A substantial Parliamentary fund—£5,000 is the target—is called for to assist the North Wales (Hydro-Electricity) Protection Committee to oppose the Hydro Electric Bill which generally well informed circles believe will be presented in Parliament next session. C.P.R.E. also feel apprehensive about the possibility of hydro schemes in the Lake District and will closely watch the matter.

Mention is made of the experimental windmill generator at Costa Head, Orkney, and the B.E.A.'s alleged interest in the establishment of units in Cornwall, North Wales and Pembrokeshire. Lleyn Peninsular in North Wales is quoted particularly.

Siting of Power Stations

The opposition of C.P.R.E. to the Marchwood station proposed by B.E.A. is stimulated by a belief that development must be kept within reasonable bounds in this area. Previously Southampton Water had given reasonable protection to the New Forest area but owing to the increase of industrial concentration on the shores of Southampton Water they believe there is a substantial threat to the continued existence of the whole forest area.

Opposition to Meaford extensions, on account of dust emission and harm to amenities, and to Littlemore station at Oxford, also on grounds of harm to amenities, are mentioned.

D

NEW LITERATURE

Thermostats and Temperature Regulating Instruments

by R. Griffiths, M.Sc.

PROBABLY the first point to be made clear to electrical engineers concerning this book is that it deals with all designs of thermostat, not only the familiar bimetallic type. That said, the volume can be confidently recommended as covering the field of temperature control in a practical manner, with the accent on the working details of the many commercial instruments described. Various types of thermostat are first dealt with, and attention is then given to regulators and their operation, one chapter being devoted to a classification of control equipment. Final chapters deal with low temperature control, with relays and valves associated with temperature control, and with the classification of heat interchangers. The book is of undoubted interest to all concerned with temperature control, and in addition has much value for the electric instrument engineer. Published by Charles Griffin and Co. Ltd., 217 pages, 9 in. by 5¾ in. Third edition, price 20s.

Principles of Electrical Engineering

by G. C. Blalock

WRITTEN for the student specialising in some branch of engineering other than electrical, this American undergraduate textbook concentrates mainly on electrical machines, although basic theory and transmission and distribution topics are not neglected. Its value for its intended application is increased by the attention given throughout the text to operational characteristics and typical applications, which may help the non-electrical student to stomach otherwise unappetising theory and vector diagrams. A feature of the book is the collections of exercises which follow each chapter, and a group of 37 laboratory exercises suitable for use in connection with a degree course. Published by McGraw-Hill, 605 pages, 9 in. by 5¾ in. Third edition, price 47s.

Alternating Current Armature Windings

by C. S. Siskind

THEORY, practice and design—so runs the sub-title of Professor Siskind's present volume, and those aspects of this most important subject are dealt with in something like that order of attention. As has been the case with other works from the same pen, the dullness that can too easily creep into descriptions of windings has been avoided by a close attention to the practical reasons for various methods.

Introductory chapters are followed by a treatment of single-phase machines; concentric-chain, wave and lap windings for polyphase armatures are then dealt with, and methods of connecting for different voltages are described. In later chapters the reasons for fractional-pitch and fractional-slot windings are summarised and practical methods of obtaining them developed. Like its companion volume on d.c. windings, this is a text and reference book which can be confidently recommended. Published by McGraw-Hill, 236 pages, 9 in. by 6 in. Price 42s. 6d.

The Ironmonger's Directory of Branded Hardware

THIS first edition should find a ready welcome, for it will prove most useful to those who are frequently confronted with the problem "who makes it?" It lists, in alphabetical order, about 14,000 branded goods current in the hardware trade, giving the name of the manufacturer or sole distributor. Some electrical items are included, of course, but there is no complementary directory of firms. Published by Morgan Brothers. 154 pp. 8 by 5½ in. Price 6s.

Electric Power Stations—Vol. II

by T. H. Carr, M.Inst.C.E., M.I.E.E., M.I.Mech.E.

VOLUME II of this well-known work is that which mainly deals with electrical equipment from alternators and switchgear to station lighting. The chapters on these and associated subjects appear in this third edition little changed, apart from additional data and some new illustrations: the major difference lies in the new matter that has been added on hydro-electric, diesel electric, gas turbine, wind and atomic plants. These additions, though not so comprehensive in treatment as the major section on steam stations, do add considerably to the completeness of the whole work as a valuable reference book. Published by Chapman and Hall, 821 pages, 8½ in. by 5½ in. Third edition, 75s.

Capacitors for Industry

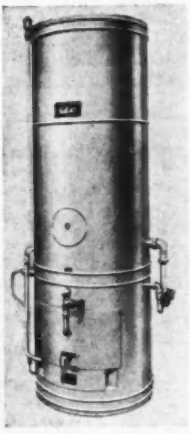
ed. by W. C. Bloomquist

CAPACITORS have a wide application to the improvement of the power factor of industrial loads. The volume under review consists of a series of forcibly written articles intended as propaganda for the further use of capacitors for such duties. This is not to say that there is no technical merit in the work—it includes an exposition of the theory and application of capacitors that should appeal to the plant engineer and works electrician—but the writing is aimed at overcoming an apparent American prejudice against this form of power factor correction that does not exist strongly in this country. Nevertheless, the many tables and nomograms, together with the notes on control and on siting, make the book a useful addition to the reference library. Published by Chapman and Hall, 246 pages, 9 in. by 6 in. Price 36s.

The BUYER'S *Column*

New G.E.C. Storage Block Steam Raiser

THE range of storage block steam raisers/water heaters supplied by THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2 has been increased by the introduction of a new model, HO.5104, with a loading of 2 kW for the steam raiser and 2 kW or 3 kW for the water heater. The water heater has a capacity of 50 gallons and as with all water heaters supplied by the G.E.C., it has a copper interior. This equipment provides steam and hot water at predetermined times, operation being controlled automatically. Its principal use is for sterilising recorder milking plant, although it may also be used for other applications in dairies.



G.E.C.'s HO.5104

Flameproof Lighting Units by Simplex

The ceiling mounting model

NEW to the range of Buxton certified flameproof lighting equipment produced by SIMPLEX ELECTRIC CO. LTD., Oldbury, Birmingham, is the 60/100 W conduit entry lantern which we have illustrated.

Of two main types—pendant or ceiling mounting (see illustration) the lanterns comply fully with BSS 889/47, Class A glass being fitted.

The body is cast iron enclosing a lampholder of porcelain with permanent heat-resisting connections to stem terminals passing through the body to the connection box.

The internal reflector is so fitted that the maximum amount of light is directed downwards. It permits free circulation of the cooling convection currents.

External reflectors of vitreous enamelled steel are fitted, the dispersive reflector being designed to give the required 20° light cut off. An angle reflector can be supplied as required.

Preparing for the Lengthening Shadows

THE recent appearance of the new season's list of the fittings produced by KNIGHTSHADES, LTD., Derby Rd. Works, Edmonton, N.18, will be welcomed by dealers and consumers alike.

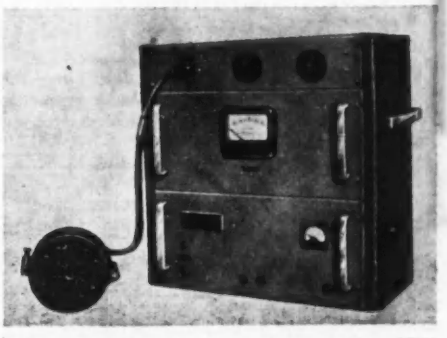
A range of attractive table lamps in pottery, wrought metal, and alabaster, lamp shades for table and floor standard lamps in "Lumex" "Nacrolaque" and "Crinothene" plastics, ceiling and pendant fittings and bedlights is available. Each model evidences the care in design and production coupled with attractive looks which are well-known qualities of the products of this firm.

Gauging Cable Eccentricity

TO test the eccentricity of conductors relative to the surrounding insulation in extruded wires and cables the ADDISON ELECTRIC CO., LTD., of 163 Holland Park Ave., W.11, have designed and produced the type 155A eccentricity gauge.

It comprises two separate units: (*a*) a gauge head comprising a coil system housed in a split cast-iron case through which the cable under test passes; and (*b*) a control unit incorporating an electronic oscillator which supplies a substantially constant current to the cable under test and a detector amplifier which gives a direct reading of the eccentricity. The control unit also incorporates a relay for the automatic operation of warning signals should the eccentricity exceed the specified tolerance.

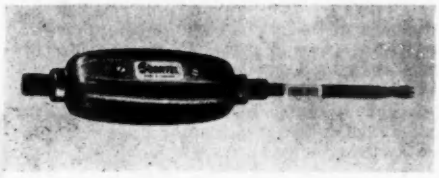
A number of extruders may be supervised from the one unit provided each channel has its own guage head. A manually or motor-operated switch unit is employed to transfer the oscillator output, and amplifier input, terminals cyclically from one measuring position to another.



Addison Electric Co. have designed this 155A model to test cable eccentricity. The gauge head through which the cable passes is on the left

Suppressors for Wolf Drills

THE introduction of "Suratel" suppressors for the Wolf Cub Home Constructor Drill for both radio and television has been announced by WOLF ELECTRIC TOOLS, LTD., Hanger Lane, Ealing, W.5. Both suppressors are the result of prolonged experiment and research work in close collaboration with G.P.O. engineers.



The "Suratel" radio suppressor is designed to eliminate interference on the B.B.C. broadcast wavelengths to the limits specified in B.S.800 and complies with B.S.613 and B.S.082. It is of a neat streamlined design in a black wrinkle finish and weighs approximately 6 ozs.

Compactly housed in a strong pressure die-cast case which is effectively earthed, it is fitted at one end with a short length of TRS cable for connection to a three-pin plug. The other end is free to take the drill cable which is passed through a cable sleeve and connected to the clearly marked terminal panel which is exposed by removal of the top half of the casing.

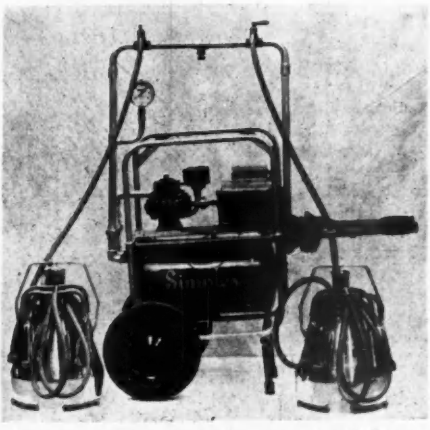
Iron-cored-wave wound inductors are incorporated and all electrical parts are well insulated.

Designed specifically for the Wolf Cub Drill 200/250 voltage range and with a maximum current rating of one amp, it is important that the "Suratel" radio suppressor is fitted and used only according to the instructions supplied. The "Suratel" radio suppressor is priced at 23s. 6d.

Unlike the radio unit "Suratel" television suppressors are fitted *inside* the Cub Drill body, as close to the commutator as possible in order to achieve maximum efficiency. Machines should be returned to the Wolf Service Depots where a "Suratel" will be fitted at a standard charge of 8s. 6d., including return postage.

Modern Milking Methods

OF great importance to the farming communities is the new electric "Universal" milking machine by SIMPLEX DAIRY EQUIPMENT CO., LTD., Centra House, Cambridge, which was exhibited at the Royal Show early last month (see ELECTRICAL TIMES, July 5).



It was produced at the request of farmers worried about the increased costs and possible reductions in the supply of petrol. Fitted with a "Hoover" electric motor and an ample length of t.r.s. cable, the milker is truly mobile, limited only by position of available power points.

The standard bucket-type milking unit, which has been praised in many quarters for its low vacuum and light teat cup assembly, is capable of milking two cows at the same time. Another point in favour of this electric model is its price, £75 complete, which is £10 less than the petrol model. This unit can, if desired, be mounted as a fixed unit.

TRADE PUBLICATIONS

SPEECH RECORDING.—A leaflet describing the "Ediphone," the Edison voice writer, is available from Thomas A. Edison, Ltd., Victoria House, Southampton Row, London W.C.1.

WELDING.—The Quasi-Arc Co., Ltd., Bilston, Staffordshire, are sole licensees in the United Kingdom for the "Unionmelt" automatic welding process which they describe in a recent brochure.

METAL BONDING.—In a recent issue of *Aero Research Technical Notes*, issued by Aero Research, Ltd., Duxford, Cambridge, there is an interesting account of various metal adhesive processes.

ELECTROMAGNETIC CLUTCHES.—From Electromagnets, Ltd., Boxmag Works, Bond Street, Birmingham 19, we have received a copy of the leaflet No. 50 giving technical details of a standard range of electromagnetic clutches.

WELDING METALS.—In the 8th issue of *Murex Review*, published by Murex, Ltd., Rainham, Essex, are articles on zirconium and the manufacture of cemented tungsten carbide.

PUMPS.—*Bepco Journal*, a publication of Bepco Canada, Ltd., features an article on modern design pump sets in a recent issue.

PLASTICS.—A reprint from *Product Engineering*, by Plastic Engineers, Ltd., Treforest, Glamorgan, features the use of nylon in bearings and gears.

ELECTRIC TRUCKS.—Trucks, tractors and fork-lifts by Ransomes, Sims and Jeffries Ltd., Orwell Works, Ipswich, are described in leaflet EA 154064 C.514.

Progress in Welding Research

CONTINUED increase in membership of the British Welding Research Association, and a very satisfactory year's work by the various research committees were noted by Sir Charles Lillicrap, K.C.B., Chairman of the Council of the Association, when he introduced the report and accounts for the year ended March 31, 1951, at the sixth annual general meeting recently. Financially the year had resulted in a balance of £2,400 being transferred to the accumulated reserve fund.

The greater part of the annual report is occupied with a review of research progress during the year 1950-51, arranged under the various research sections. Metallurgical work on ferrous metals has included an investigation of the effect of high temperature heating on the transformation of austenite, and the development of a simple weldability test suitable for specification purposes. With respect to light alloys, the main work has been concerned with metal arc and argon arc welding of aluminium alloys. An investigation has also been started into the fusion welding of magnesium rich alloys.

Much of the effort in the engineering field, as regards ferrous metals, has been centred on frame structures, and on pressure pipe lines and pressure vessels. In the latter classification, preliminary work has been carried out on branch connections in pipelines and on the fatigue testing of welded joints in pipelines. A final report has been issued on the behaviour of pipe bends under internal pressure and static internal pressure tests have been carried out on a full scale pressure vessel.

Considerable expansion of the resistance welding section of the Association was one of the features of the year under review, and a comprehensive range of control gear and electronic instruments has been built up. The main emphasis has been centred on the spot welding of mild steel and certain aluminium alloys and on the projection welding of mild steel and the preparation of a memorandum on flash welding dealing in particular with ferrous metals.

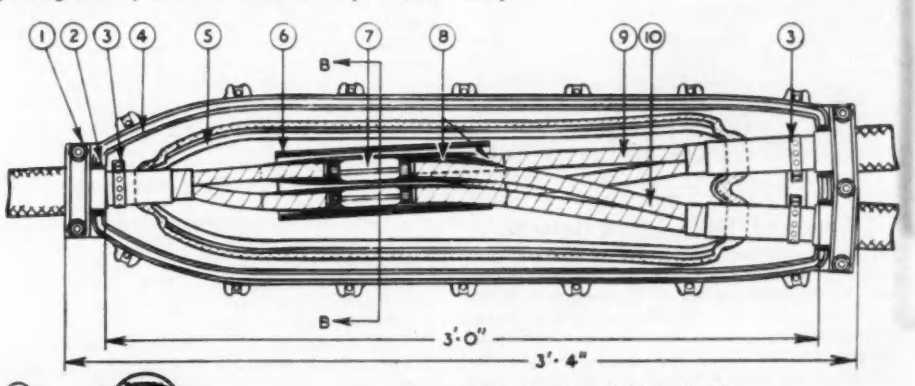
In connection with the resistance welding of light alloys, interest is developing in the three-phase frequency changer type of machine.

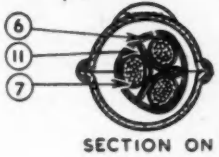
NEW CABLE JOINT

BRANCH connections to h.v. underground cables in the range 3·3 kV to 11 kV are facilitated by the new joint recently added by W. T. Henley's to their range of cable accessories. The constructional features of the joint, shown in the drawing, closely resemble those of the company's straight through joint.

Suitable for 3-core cables up to 0·2 sq in. conductor cross section, the design has grip type jointing sleeves, and it is not necessary to cut the main cable, which may be taken out of either side of the box. The lead box is split on the centre line, pressed from extruded lead sheet, and provided with a flanged joint as used for Henley service boxes. Provision is made for handling the lead of the cable to the c.i. protection box.

Impulse and 50 cycle breakdown tests carried out on test joints in the Henley Research Laboratories prove that the design has a high factor of safety.





SECTION ON BB

Details of the new parallel branch joint

1. *Armour clamp.* 2. *Two-inch wide lead/tin alloy strip.* 3. *Perforated t.c. strip for bonding lead sheathing.* 4. *C.I. box with large filling and inspection covers.* 5. *Lead box with horizontal flanged joint.* 6. *Paper binder (impregnated).* 7. *Standard grip-type sleeve.* 8. *Paper cotton tape insulation (impregnated).* 9. *Uncut main cable.* 10. *Branch cable.* 11. *Paper separator (impregnated), with metallised paper screen*

THE WEEK

COMMERCE *in news* INDUSTRY

A National Fuel Policy

THE Minister of Fuel and Power announced last week the formation of a committee to advise him on methods of making the best possible use of fuel supplies. This step, following hard on the heels of the recommendations advanced by the Electricity Sub-committee (dealt with elsewhere in this issue), indicates a serious attack on the problems which face the authorities during this coming winter. The Committee on National Fuel Policy will be under the chairmanship of Viscount Ridley, chairman of Northumberland C.C. and a member of the former Fuel and Power Advisory Council. It will consist of seven members including Sir Claude Gibb, chairman and managing director of C. A. Parsons and Co. Ltd. The terms of reference of this committee will be "to consider whether further steps can be taken to promote the best use of fuel and power resources, having regard to present and prospective requirements and in the light of technical developments."

Fall in Radio and T.V. Sales

SALES of radio and television sets fell appreciably during June according to the R.T.R.A. index for that month just published. Although the decline in relation to the previous month may be attributed to seasonal slackening in trade, it is to be noted that these figures also fall below comparative sales last year. The imposition of additional purchase tax in April may account for this fact. The average number of sets sold per shop is as follows:

Month	1951	1950
RADIO		
May	8.35	8.92
June	6.31	8.11
TELEVISION		
May	6.43	6.32
June	3.32	3.88

Iron and Steel Prices Raised

THE controlled maximum prices of iron and steel products have been increased under a new Ministry of Supply order which became effective as from last Monday. These increases were stated to be necessary due to a sharp rise in the prices of imports of iron ore, scrap, pig iron and semi-manufactured steel, and increases in costs in this country of wages, scrap, fuel charges and the like. Hitherto the Exchequer has borne the loss arising from buying finished steel abroad and selling it here, and this loss has risen sharply in recent months. The consequent adjustment in this field accounts for over 20%, and other imported steel and steel making materials account for some 40% of the overall price increases. Examples of the new prices are £11 4s. 6d. for foundry pig iron, and £11 15s. 6d. for basic pig iron, rises of 11s. 6d. and 16s. 6d. respectively. Similarly, the price of rerolled bars has increased by £4 16s. to £27 11s. and of uncoated sheets by £6 2s. 6d. to £35 15s. 6d. At the same time the controlled maximum prices of nuts and bolts have also been raised.

S.E.E.B. Purchasing Arrangements

NEW purchasing arrangements which have altered to some extent the functions of the relevant department at headquarters, have been announced by the S.E. Electricity Board. They became operative as from yesterday (August 15). The Engineer-in-Chief, Mr. W. A. Gallon, will in future be responsible for engineering supplies for use on the Board's side of consumers' terminals, and for the sale of scrap. He will also be responsible, through the surveyor, for building construction supplies, repairs and maintenance, and through the Transport and Stores Officer, for vehicles and other supplies for repairs and maintenance. The Chief Commercial Officer, Mr. C. F. Wells, will handle all equipment and apparatus on the consumers' side of the terminals, and the Secretary, Mr. A. L. Burnell will deal with publications, printing, stationery and office accoutrements.

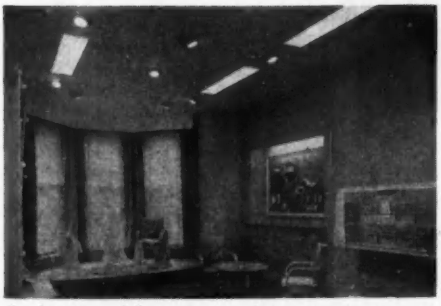
Consequent upon this reallocation of functions some members of the Purchasing Department's staff have been transferred. Both the Engineer-in-Chief's and the Chief Commercial Officer's department have been reinforced by two and the Secretary's department by one. The Board asks that relevant correspondence should in future be addressed to the appropriate Chief Officer.

The First Half-Century

The S.S. *Discovery* has taken with her to the Antarctic region probably a unique electrical lighting plant. This was designed by Mr. Arthur Bergtheil. The great difficulty hitherto found in using wind as a motive power for electrical purposes has been the fluctuation in speed of the wind. This difficulty has been overcome by using two generators, the one opposed to the other when mounted on the same shaft, with the result that with the dynamo running at speeds from 500 to 2,000 r.p.m. a practically constant voltage is obtained.—*From our issue of August* 15, 1901.

Grant-aided Supply to Farms

THE Secretary of State for Scotland, Mr. McNeil, stated recently that 149 of the 400 improvement schemes under the Hill Farming Act 1946, or Livestock Rearing Act, 1951, which had so far been approved, included proposals for electricity at an estimated total cost of £75,170, half of which would be repayable by way of grant. The majority of these proposals concerned connections to public supply, but where such a supply was unlikely to be available for some time, approval would be given to schemes involving private generating plants. Mr. McNeil added that no special grants



Combination of fluorescent and tungsten lamps used to good effect at I.C.I. Ltd.'s exhibition room opened a short time ago at Welwyn, Herts. . . .

were given to help farmers instal electricity, but a supply could be grant-aided if it formed part of a comprehensive scheme of improvement under the Acts already mentioned.

1951 Design Congress

THE first international discussion by industrialists of the design policies will take place at the Royal College of Art (London) on September 19 and 20. It is being organised by the Council of Industrial Design and some 250 delegates will be representative of leading firms in this country, Europe and the U.S. Meetings will be held concurrently in three groups, the third being of greatest interest to the electrical industry. Among the speakers in this group will be Mr. A. N. Bec Var of the General Electric Co. (U.S.A.) and Mr. C. S. Agate of Engineering Development Ltd.

Barking-Ilford Cable Installation

FROM the N.E. corner of the London Electricity Division comes news of good progress in the installation of a 132 kV underground cable between Barking and Ilford. The contract, awarded to British Insulated Callender's Cables Ltd., involves some 9,000 yd of two 3-core 0.6 sq in. impregnated pressure cables, associated auxiliary cables and some 33 kV solid type cable, and is claimed to be one of the largest installations of its kind undertaken in this country. When completed it will provide a major reinforcement to the existing network in that district.

The new lines will be connected at Barking to a switchhouse being built in conjunction with extensions at Barking C. At the Ilford end they are to be connected to a substation where voltage will be stepped down to 33 kV and distributed over 33 kV cable.

Fabric Display Lighting

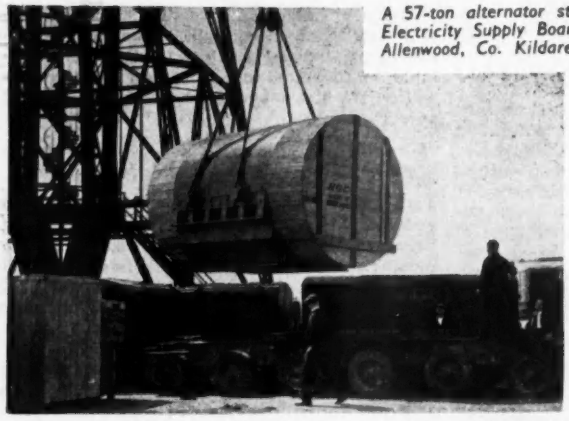
THE accompanying photographs provide two good examples of display lighting employing British Thomson-Houston equipment and both involving the presentation of fabrics. A mixed lighting system comprising fluorescent and tungsten lamps was used in the new exhibition room opened by Imperial Chemical Industries Ltd. at Welwyn, Herts, for the display of products made from "Terylene" a new synthetic fibre. Natural colour fluorescent lamps have been placed in louvered fittings and mounted flush to the ceiling. These are supplemented and interspersed by tungsten spotlamp fittings to accentuate particular exhibits. The spotlamps are housed in swivel holders so that they can be trained in any direction. Daylight colour lamps have been used on the premises of Wilde Ltd., tailors of Edgware, where the ability to discern varying colours is of the utmost importance. The louvered fittings blend admirably with the modern decoration of the shop.

. . . Suitable lighting for the display of cloth, facilitating accurate choice of colours, at the small shop of a London tailor

Exam for Physicists

ESTABLISHMENT of an examination by which those not holding a recognised university degree may satisfy the academic requirements for Graduateship of the Institute of Physics has been announced by the Board of the Institute.

Candidates for the new examination will normally be required to have followed a suitable course of study at a college or other institution recognised for this purpose by the Institute. The subjects of the examination are physics (three papers and a practical examination), mathematics (two papers) and a third subject (one paper) chosen by the candidate from (*a*) applied physics, (*b*) more advanced physics, (*c*) mathematical physics, and (*d*) statistics. Those choosing applied physics will be required to offer only one of the



A 57-ton alternator stator being unloaded in Dublin for the Electricity Supply Board's second turf-fired power station at Allenwood, Co. Kildare. It was made by the G.E.C., and is reported to have cost in the region of £440,000

sections (i) electronics, (ii) high vacuum technology, (iii) acoustics, (iv) spectroscopy, (v) X-rays or (vi) temperature measurement.

The first examination will be held in 1952, and copies of a booklet containing the full regulations and syllabuses of the Graduateship examination may be obtained free, on request, from the Institute of Physics, 47 Belgrave Square, London, S.W.1.

Metals Economy

AN advisory committee on metals economy has been appointed by the Minister of Supply and Materials to ensure the most economical use of metals in the engineering industry and in the rearmament programme. The committee's terms of reference will be to review ways of economising in the use of scarce metals in the design, specification and manufacturing process of metal goods for both rearmament and civil purposes. It will advise the Government how it can best assist in promoting such developments. The committee will be under the chairmanship of Mr. D. A. Oliver, who recently became metals economy adviser to the Minister of Supply.

Fluorescent Street Lighting

SWANSEA and Macclesfield were the scenes of recent examples of fluorescent street lighting installations. In the former's principal thoroughfare, Kingsway, Metropolitan-Vickers' "City" lanterns and lamps were employed, mounted on concrete columns. Each of the lanterns housed three 5 ft 80 W tubular lamps and as can be seen from the accompanying illustration, the scheme provided effective lighting by night and a dignified appearance, appropriate to the surroundings, at all times. At Macclesfield, steel columns were used along the main Stockport-Potteries road within the borough and Siemens Electric Lamps and Supplies were responsible for the supply of equipment in this instance. As at Swansea, these lanterns each housed three 80 W tubes. The initial installation in the borough of 29 lanterns, has been followed by an additional 15. This latter scheme was installed by the N.W. Electricity Board.

Television Tie-up

IT was announced last week that Broadcast Relay Service Ltd. and Electric and Musical Industries Ltd. have agreed a long term basis of co-operation in the field of wired television. The two groups are to pool their research and techniques in this field and thus E.M.I. development and manufacturing resources will be allied to the operating experience of the Broadcast Relay Rediffusion Group in the distribution of broadcast programmes. This arrangement envisages the participation of radio retailers. The introduction of the retail trade by E.M.I. in these arrangements will no doubt be of interest to television dealers, as it will give them the opportunity of participating in existing or new television relay services operated by B.R.S.

A.S.E.E. Swann Diploma

RESULTS of the 1951 examination under the Diploma Scheme were announced last week by

Recent examples of fluorescent street lighting with equipment supplied by Metropolitan-Vickers at Swansea (below) and Siemens at Macclesfield (left)

the Association of Supervising Electrical Engineers. The examination was held in various centres on May 23 and 24 and three candidates were successful. These were Messrs. G. A. Merritt of Epsom, Surrey, M. T. O'Brien, Plymouth, and A.G. Rutherford of Cupar, Fife, who have been awarded the Swann Diploma. This was the sixth such examination to be held. A number of candidates were successful in passing part 1 of the examination only. Arrangements for next year's diploma scheme are well in hand and an announcement is expected to be made in November.

Jet Planes to use D.M. Equipment

DISTANCE measuring equipment designed and developed at the Edinburgh works of Ferranti Ltd., is to be used in B.O.A.C.'s scheduled service to the Middle East. This service will be the first to use jet aircraft, the De Havilland Comet, and is due to start this autumn. The equipment is a short range radar navigational aid which gives the pilot his exact distance from a particular beacon on the ground. It was approved by the Division of International Civil Aviation Organisation a short time ago. The first overseas installation of the ground component of this equipment is being carried out near Rome by the company's engineers. A similar beacon is already in operation at London airport and a third will be fitted shortly in Cairo. Thus there will be D.M.E. facilities at each of the three stopping points on the new route.

Bogota's T.V. Service

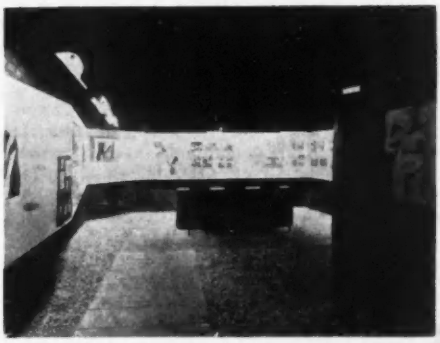
FOLLOWING contracts for the supply of transmitters and complete studio centres for U.N.O. in New York, and to Montreal, Toronto, Madrid and Barcelona, the Marconi Co. have received an order for similar television equipment from Bogota, Colombia. The equipment is to be manufactured to the American standard of 525 lines. E. K. Cole Ltd. will provide the receivers. A remarkable fact about this contract, in passing, is that television in Bogota will be run by the Municipality. With the co-operation of the Municipal Bank of Bogota, the town will not only provide all the programmes but also supply receivers under a hire purchase scheme.

Trade with Cuba

ONE of the clauses in the new trade agreement with Cuba announced by Sir Hartley Shawcross last week was that Cuba will reduce her import duties on a number of U.K. goods to the preferential rate levied on U.S. goods. Hitherto duty on our products had been about twice that on American exports. The list contains some 80 items, among which are wireless and television apparatus and instruments. The effect of this agreement will be to give manufacturers in this country a chance to compete on equal terms with their American counterparts for some $85 million worth of trade.

E.I.B.A. Golf—National Final

AS announced in our June 21 issue the National Final of the E.I.B.A. Golf Championship is to take place at the Southport and Ainsdale Club on



Fluorescent lamps supplied by Siemens Electric Lamps and Supplies Ltd. used to illuminate a display at the Exhibition of Architecture, Belfast. The exhibition has been set out in the ruins of Coate's Buildings in Castle Street, one of the City's bomb-damaged sites

September 24 and 25. A full programme for the two-day event has now been worked out. It starts with the competition for the Visitors' Rose Bowl on Monday morning. Entrance fee for this event is 10s., and application forms may be obtained from any area secretary or from the Hon. Sec., Mr. W. J. Bird, at Magnet House, Kingsway, W.C.2. Other events on that day will be the competition for the Veteran's trophy and a dinner at the Palace Hotel, Birkdale. The championship final for Sir Montagu Hughman trophy will take place on Tuesday, as also will the foursomes competition.

T.V. Training Scheme

IN view of the extension of television service, the G.E.C. is providing two T.V. training centres for its approved radio dealers in Scotland. One is now operating at Magnet House, Waterloo Street, Glasgow, and will remain open until the end of September. The second will open at 8 George Street, Edinburgh, on October 1, for five weeks. Each course lasts a week and includes theoretical instruction and practice in the localising and rectifying of faults on receivers.

E.A.W.'s 1952 Annual Conference

It was announced last weekend that the 27th annual conference of the Electrical Association for Women will take place at Scarborough between May 19 and 24 next year. Programmes and invitations for this conference will be dispatched as soon as practicable.

NEWS IN BRIEF

Recent orders secured by A. Reyrolle and Co. Ltd. include 16 33 kV circuit breakers and ancilliary equipment for Belfast, and 11 220 kV breakers for the transmission system of State Electricity Commission of Victoria, Australia.

The I.G. Farben Central Laboratory index giving technical information about chemical products marketed under trade names in Europe and

America, is available from the Dept. of Scientific and Industrial Research, Lacon House, Theobald's Road, W.C.1.

The annual report for 1950 of the Ministry of Works has been published by H.M.S.O. Output of building and civil engineering industries amounted to £1,307 million and some £20 million of building materials and £18½ million of fitments was exported. The price of materials and components as a whole rose during the year by 8%.

Much equipment was destroyed when fire swept through the Seaford (Sussex) factory of Champion Electric Corporation last week. But the employees have been absorbed at the firm's new factory at Newhaven we understand.

A small booklet explaining the main provisions of the Mineworkers Pension Scheme has been published by the National Coal Board.

Wellington Show and Industrial Fair is to be held at Show Building, John St., Wellington, New Zealand, from May 8 to 31, 1952. Organised by the Wellington Show Association Inc., Huddart Parker Building, Wellington, C.1, it is hoped to stage the event annually in future.

The Federation of British Industries has compiled a booklet containing a report of the Industrial Research Conference held at Ashorne Hill, Leamington Spa, last November.

Electric Supply News

Aldridge

The U.D.C. has made representations to the Ministry of Fuel and Power concerning a proposal of a power line over Barr Beacon ridge, a local beauty spot and ancient seat of the Druids. The power line would run from Smethwick to Drakelow power station, near Burton-on-Trent, and is scheduled to cross the ridge near the 700-ft. beacon itself. The council wants the route altered or the cable put underground.

Eire

The Electricity Supply Board has announced that they will not be able to permit unrestricted use of electricity for space heating during the winter, and that they are considering the restrictions to be operated.

The statement says that without such restrictions, the board could not guarantee continuous power for industry, domestic cooking, hospitals, institutions and other essential uses, and that they might have to resort to load shedding.

The work of erecting a third turf-burning generating station for the Electricity Supply Board is about to be proceeded with at Firbane. The new site is in the heart of a bog land centre on the river Brosna-Boora Bog, which has been in the course of preparation for the past four years. A survey party recently visited Boora to lay out the site. A great many of the original difficulties of generating power from turf fuel have been overcome, and although the fuel costs much more than coal and has a lower calorific value, the Government considers it better to proceed with the scheme than await coal from overseas which may not arrive.

Fife

Proposals to erect a new generating station in the Methill Dock area have been temporarily held up because the National Coal Board has stated that the Fife coalfield could not supply the 750,000 tons of coal a year which would be needed, it is reported. The Docks and Inland Waterways Executive has approved the plan, apparently, but the N.C.B. argue that provision of that amount of fuel for the power station would leave none for export.

Inveraray

This town was, last week, given its first public supply of electricity. The burgh is the latest community to be connected to the distribution lines of the North of Scotland Hydro-Electric Board. Approximately 50 houses and premises in the town were connected and a further 50 places in the town, including Inveraray Castle, are being wired, and shortly will be supplied.

North Tees

The first 60 MW unit in the new North Tees "C" generating station, Billingham, is expected to go into operation at the end of this year. When completed, probably in 1953, the plant installed will consist of four 60 MW Parsons turbo-alternators and seven 360 klb/hr Babcock and Wilcox boilers.

Northern Ireland

The Electricity Board for Northern Ireland is contesting a condition which the Omagh U.D.C. seeks to impose on the Board in regard to power lines. The condition provides that the cost of future removal of lines and equipment erected by the Board should fall on the latter even though such removal be at the request of the Council to enable it to carry out building programmes, etc. For the Board it was stated that it was established practice in Ulster for the cost to fall on the local authority where the removal was at their instigation. Such procedure applies in England. The Board was appealing against the decision of Omagh U.D.C. on the Board's application for permission to carry out development involving an extension by 291 yards of a 33 kV line. The appeal was heard by an inspector of the Ministry of Health and Local Government.

LIGHTING SCHEMES

Chichester.—T.C. to re-light part of Bognor Road and Whyke Road, at a cost of £1,050.

Dudley.—T.C. is recommended to invite tenders for supply and erection of street lighting

equipment at the centre of the town, at an estimated cost of £20,000.

Cambridge.—The City Council has approved a recommendation to convert the public lighting on main roads in Cambridge from gas lamps to sodium, at a cost of £26,720.

Fylde.—The R.D.C. has approved a scheme of lighting in the main streets at Warton, at a cost of £2,369.

Enfield (Middx.).—A scheme for the improvement of street lighting costing approximately £20,000, is to be submitted to the Minister of Transport for approval.

Ilfracombe.—As the contract for gas street lighting expires next April, the U.D.C. is to inquire into the possibility of changing to electricity.

Narborough (Leics.).—Conversion of the 72 street lamps from gas to electricity is being considered by the parish council.

Northampton.—The Highways Committee has now proposed that the street lighting conversion scheme, to which we referred last week, be effected in three years instead of 15. The scheme is being put before the Ministry.

Nottingham.—The City Council Housing Committee has approved plans for new roads, etc., including street lighting on the Clifton estate. The lighting in Valley Road to be improved.

Oldham.—The Finance Committee has approved a scheme for sodium lighting in Middleton Road.

Rochdale.—A delegation from the T.C. is seeking an interview with representatives of the M.o.T. concerning the latter's refusal to sanction a loan of £6,420 for conversion of street lighting.

Salford.—The Street Lighting Committee has recommended application for a supplementary estimate for £1,225 for improved lighting.

Sowerby Bridge.—U.D.C. applying for sanction to borrow £3,300 for improved lighting along the main street.

Swadlincote.—The M.O.T. has objected to some of the proposals made by the U.D.C. in the third stage of its electric street lighting programme.

Company Activities

John Brown & Co., Ltd.

The group trading profit for the year ended March 31 last was £1,901,277 compared with £1,569,902 for the previous twelve months. Gross income from investments amounted to £323,130 (*£357,791*), and income relating to previous years £2,267 (*£13,421*), making a total profit balance of £2,226,674, as against £1,941,114. To expenditure on research £37,220 (*£46,556*), depreciation £266,560 (*£253,955*), debenture and loan interest, gross, £55,656 (*£17,171*), and U.K. taxation £1,116,798 (*£855,832*), leaving a net profit of £750,440 (*£767,600*). Current assets are listed at £13,386,290 (*£7,061,843*), including stock and work at £3,059,939, after deducting instalments on account of work in progress £8,984,146. Current liabilities amount to £3,481,679 (*£2,583,461*). As was previously announced, consent was given by the Treasury to the issue by the company of 4,307,787 Ordinary shares of 10s. each, by way of capitalisation of reserves. The resulting shares were consolidated with the existing Ordinary capital into units of £1 each.

Christy Bros., Ltd.

For the year to March 31 last, the group profit of this electrical engineering and contracting concern amounted to £32,176 compared with £30,472 for the previous twelve months. This figure is after allocating £40,339 (*£35,372*) to taxation. This dividend is again 6% on the old Ordinary, and there is also a dividend of 1½% on the new Ordinary. The sum of £23,429 (*£18,446*) is carried forward.

Mirrlees Watson & Co.

For the year to March 31 last, the group trading profit was £273,580, compared with £191,418 for the previous twelve months. This is after charging £47,583 (*£42,689*) to depreciation, etc. The profit after allowing for taxation, etc., was £112,575 (*£98,717*).

Skefko Ball Bearing Co., Ltd.

The directors announce that they are giving consideration to the lodgement in the near future of an application to the Capital Issues Committee for consent to a rights offer of 400,000 5s. Ordinary shares, on the basis of one for eight held.

Venner Time Switches Ltd.

The Board considers that exceptional circumstances exist which may justify an application to the Treasury, when the time comes, for the Ordinary dividend for the year ending December 31 next, to be increased above the amount permissible, says Mr. A. A. Rowse, chairman, in his statement accompanying the full accounts. The decision to increase the dividend by 7½% to 12½%, was announced some days before the statement by the Chancellor of the Exchequer. The larger dividend signalises the emergence of the company's business from a difficult period of trading during which small or no Ordinary dividends were paid. All losses for taxation purposes have now been exhausted so that provision for the future will be proportionate to the profits earned. Trading profit, after providing for all charges, including depreciation and £33,650 for stock obsolescence, is £44,071, to which is added £15,529 brought forward. To taxation £20,028, and to general reserve £10,000. Current assets are listed at £387,533 of which £261,663 relates to stock and work in progress. Current liabilities total £84,504.

Dividend Declared

Herbert Terry and Sons.—Interim dividend of 5% (*same*), payable on August 22.

Commercial Information

CONTRACTS OPEN

HOME

Aug. 17.—Birkenhead. Tenders invited for sub-contract work including electric light and power installation at Birkenhead technical college. Names to Willink and Dod, C.As., Cunard Building, Liverpool.

Aug. 17.—Newcastle-on-Tyne T.C. Provision of electricity supply and o.h. line equipment. Frank S. Taylor, General Manager, Transport and Electricity Undertaking, Head Office, Manors, Newcastle 1.

Aug. 17.—York. Electrical rewiring of portion of Cattle Market. City Engineer and Architect, C. J. Minter, Guildhall. Deposit £1.

Aug. 18.—Bath. Supply of electrical and other fittings for street lighting. City Engineer, Guildhall. Deposit £1 1s.

Aug 18.—Warsop (Notts) U.D.C. Wiring for electricity of 147 houses in Fitzherbert St. area. Applications to R. J. Smith, Clerk to Council, Town Hall. Deposit £2 2s.

Aug. 20.—Bournemouth T.C. Supply of diesel alternator set 70 to 100 kVA, 200/346 V, 3 phase, with control panel, for Pavilion. Further information from Pavilion General Manager. Tenders to A. Lindsay Clegg, Town Clerk, Town Hall.

Aug. 20.—Durham. Electrical installation in 10 houses on Merry Oaks estate. County Architect, Court Lane.

Aug. 20.—Surrey. Provision and erection of 51 concrete columns, 140 W sodium lamps and ancillary equipment along Kingston By-Pass (A.3). County Engineer, County Hall, Kingston.

Aug. 21.—Aberdeen. Electrical work at Woodlands Home, Cults, for Board of Management for Aberdeen Mental Hospitals. Applications by above date to Allan G. Hamilton, secretary, 62 Queen's Rd., Aberdeen.

Aug. 21.—Sunderland T.C. Electrical installation in 12 shops and flats on Pennywell estate. Borough Architect, Grange House, Stockton Rd., Sunderland. Deposit £2 2s.

Aug. 22.—Keighley T.C. Supply of 14 5-ft fluorescent fittings, 14 sets of control gear and 28 warm white lamps for Central Library and Hall. Tenders to Town Clerk, Town Hall.

Aug. 22.—Keynsham (Bristol) U.D.C. Electrical work in 37 houses on Norman Rd. estate, Saltford. Engineer and Surveyor, Council Offices, Keynsham. Deposit £2 2s.

Aug. 22.—Slough T.C. Supply and erection of 61 concrete columns, lanterns and 80 W mercury lamps in Stoke Poges Lane. Borough Engineer, Town Hall. Deposit £1 1s.

Aug. 22.—Tettenhall U.D.C. Supply and erection of street lighting equipment on trunk road A.41. Installation involves tubular steel columns and full "cut-off" type lanterns and sodium lamps. J. W. Mason, Engineer and Surveyor, Council Offices. Deposit £2 2s.

Aug. 23.—Forres. Electrical work in erection of new police station and houses for Scottish N.E. Counties Police Board. John Frindlay, County Architect, County Buildings, Elgin.

Aug. 24.—Fife. Electrical installation in each of following schools: Carleton primary, Glenrothes, Camdean primary, Rosyth, Valley primary, Kirkcaldy, Blacklaw primary, Dunfermline, Comrie junior secondary, Oakley. Surveyors, Messrs. James Gentles and Son, Central Chambers, High St., Kirkcaldy.

Aug. 24.—Manchester. Electrical work at Moss Side fire station. City Architect, Town Hall. Deposit £1 1s.

Aug. 25.—Dundee. Supply of standards, brackets and lamps and lanterns for street lighting. Public Lighting Engineer, 46 Dans Rd., Dundee.

Aug. 25.—Peterborough. Lighting and power installations in 188 houses on Eastfield estate. Applications by above date to F. J. Smith, City Engineer and Surveyor, Town Hall. Deposit £2 2s. (Advertised in this issue.)

Aug. 27.—Huddersfield T.C. Supply and erection of electrically driven booster pumping plant at Kirkburton. Waterworks Engineer, 24 Ramsden St. Deposit £1 1s.

Aug. 27.—Lees U.D.C. Supply and erection of 21 concrete columns and supply of 21 lanterns with 140 W sodium lamps along a section of Huddersfield Rd. Supply and erection of 34 concrete columns and provision of 34 lanterns and 150 W tungsten lamps along Stamford Rd. and St. John St. Also provision and erection of 28 concrete columns and supply of 28 lanterns with 150 W tungsten lamps along Spring Lane and Thomas St. Council Offices, Lees. All three are separate contracts and deposit in each case is £2 2s.

Aug. 27.—Manchester. Installation of fire alarm system at "Newholme," West Didsbury. City Architect, Town Hall. Deposit £1 1s. (See August 2 issue.)

Aug. 27.—Manchester. Rewiring of installation in two homes at Landho Colony, Nr. Blackburn. City Architect, City Hall. Deposit £1 1s.

Aug. 27.—Norwich. Supply and installation of 21 concrete columns, 350 yd. of lighting main and 44 yd. of cable for street lighting in Farrow and Guardian Rds. City Engineer's Office, City Hall. Deposit £2 2s. (See August 9 issue.)

Aug. 27.—Skipton U.D.C. Electrical work at the crematorium. Engineer and Surveyor, K. B. Robinson, Town Hall, Deposit £1.

Aug. 27.—West Riding. Installation of electricity at Wombwell Kings Rd. school. County Architect, "Bishopgarth," Westfield Rd., Wakefield. Deposit £1 1s.

Aug. 27.—Wolverhampton T.C. Installation of sodium mercury and fluorescent lighting, including supply and erection of steel columns, lanterns, auxiliary control and time switches. Borough Engineer, Town Hall. Deposit £2 2s. (See August 2 issue.)

Aug. 28.—Basingstoke. Electric lamps are included in list of supplies for six months beginning Oct. 1 for Park Prewett Hospital. Tenders to secretary, Frederick Hales.

Aug. 28.—Bradford. Electrical installation at Reception Block in Squire Lane. City Architect, Town Hall.

Aug. 29.—Kidwelly T.C. Supply and erection of 3 centrifugal sewage pumping units rated at 50 g.p.m. and 2 rated at 25 g.p.m. Cotterall and Son, 54 Victoria St., S.W.1. Deposit £2 2s.

Aug. 31.—Chichester. Supply and erection of 5 automatically controlled electrically driven pumping units and auxiliaries. Water Engineer's Office, Greyfriars, North St. Deposit £2 2s.

Sept. 1.—Swansea T.C. Water Dept. requires two electric battery trucks capable of carrying 15 cwt. and traversing 15 miles at one charging. T. Price, Water Engineer and Manager, The Guildhall.

Sept. 1.—Swansea T.C. Electrical installation in 115 houses at Penlan. Applications by above date to Borough Architect, The Guildhall. Deposit £2. (Advertised in this issue.)

Sept. 3.—Basingstoke T.C. Supply of 45 steel columns, 2 wall brackets, 49 3 by 80 W fluorescent tube lanterns, and removal of existing lighting points in shopping area. W. G. A. Clark, Borough Surveyor, Municipal Buildings. Deposit £2 2s. (Advertised in this issue.).

Sept. 3.—Haverfordwest T.C. Installation of electric light and power in 90 houses. Borough Surveyor, 9 Victoria Place, deposit £2.

Sept. 3.—Manchester. Supply and installation of approx. 54,000 linear yd. of cables for operating motorised valves. Secretary, Waterworks Offices, Town Hall. Deposit £5 5s. (See August 9 issue.)

Sept. 5.—Bingley U.D.C. Supply, erection and installation of 34 street lighting columns, lanterns and auxiliary equipment for scheme at Harden. J. S. Lattin, Engineer and Surveyor, Town Hall. Deposit £2 2s. (Advertised in this issue.)

Sept. 6.—Wandsworth. Supply of concrete lighting columns. Borough Engineer, Surveyor and Architect, Municipal Bldgs., S.W.18.

Sept. 6.—Widnes T.C. Supply and erection of nearly 4¼ miles of Group A street lighting. Borough Engineer and Surveyor Town Hall. (Advertised in this issue.)

Sept. 10.—Oldham T.C. Supply of concrete lamp columns, and lanterns, for Group B street lighting. C. Warwick, Lighting Superintendent, Gas St. (Advertised in this issue).

Sept. 14.—Belfast. Supply and erection of automatic fixed-type CO_2 fire fighting installations. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne 1. Deposit £5 5s. (See August 9 issue.)

Sept. 14.—Belfast. Supply and erection of ash handling plant of high pressure sluicing type capable of removing 45-50 tons per hour, for Victoria power station. Merz and McLellan, Carliol House, Newcastle-on-Tyne 1. Deposit £5 5s. (See August 2 issue.)

Sept. 14.—Tavistock U.D.C. Installation of improved standard of street lighting for main roads and shopping centre. Specification from Council's Surveyor, H. F. Robinson, Council Chambers, Drake Rd. Deposit £2 2s. Tenders to S. G. Jenkins, Clerk of Council. at same address.

Sept. 22.—Blackpool T.C. Supply of 350 concrete columns, lanterns, chokes and capacitors for Group A street lighting; 100 same for Group B, and 500 synchronous time switches with solar dials. Public Street Lighting Officer, Electrical Services Dept., Rigby Rd. East. (Advertised in this issue.)

Sept. 24.—Manchester. Installation of electrically operated sluice valves included in contract N.3 for Corp. Waterworks. Secretary, Waterworks Office, Town Hall. Deposit £10.

Oct. 3.—Downpatrick T.C. Supply and installation of 9 direct driven centrifugal electrically propelled pumps for town's sewage scheme. M. J. Hayes, Town Clerk, U.D.C. Offices. Deposit £5 5s.

No date stated —Midlothian. Electrical work in additions and alterations to Newtonloan school. County Architect, 32 Palmerston Pl., Edinburgh 12.

No date stated.—Prudhoe U.D.C. Tenders now being invited for erection of 110 houses at Oaklands. Separate tenders will be sought later for electrical installation in those houses and contractors wishing to tender should submit names to T. Philipson, Clerk of the Council, Council Offices, 18 South Rd.

No date stated —N. of Scotland H.E. Board Supply and erection of about 52 miles of 11 kV and 15 miles of l.v. wood pole overhead lines in Carmyllie district. Kennedy and Donkin, 12 Caxton St., S.W.1. Deposit £2 2s. (See August 9 issue.)

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Sept. 5.—Wellington (N.Z.). Supply of 200 ceramic, 100 mica and 250 paper tubular type condensers for Stores Division, G.P.O., Wellington, C.I. Quote "P and T 150/4668." Tenders to Director-General.

Your Queries — Answered

"Gemmell" cable suspenders, makers of? H.L.—British Insulated Callender's Cables Ltd., Norfolk House Norfolk St., W.C.2. (21109)

"Polarcold" refrigerators, makers of? T.E.—Dane Timber Mills Ltd., Spindle St., Congleton, Ches. (21116)

"Everite" ducting, makers of? L.E.—Turners Asbestos Cement Co. Ltd., Everite House, 59½ Southwark St., S.E.1. (21128)

"Q-Ray heating pads, makers of? E.B.—Radium Electric Ltd., 153 Victoria St., S.W.1. (21137)

Stocking ladder mending machine, makers of? C.W.—B. Toone and Co., Newdigate St., Nottingham. (21149)

"Shanks" lawnmower, makers of? E.C.—Alexander Shanks & Son, Ltd., Dens Iron works, Arbroath, Angus. (21153)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWERS WANTED

Handryer, with three or four apertures, makers of? B.C. (21182)

Linesman's platform, 5 ft by 2 ft for attaching to the o.h. line pole, makers of? C.C. (21189)

Sept. 12.—Brisbane. State Electricity Commission, Scottish Union Hse., Eagle St., require supply of distribution materials for Capricornia Regional Electricity Board. B.o.T. (Ref: CRE (IB) 66862/51.)

Sept. 12.—Melbourne. State Electricity Commission require supply of distribution type transformers, 6,600 V, 12,700 V and 22 kV ranging from 10 kVA to 2,000 kVA. Secretary to Commission, 22-32 William St., Melbourne. The same undertaking also invites tenders for lightning arrestors, 72 kV, 66 kV, 22 kW, 6·6 kV a.c. and 1,100 V d.c.

Sept. 15.—India. Govt. of Madras' Stores Purchase Committee seeks tenders for supply of switchgear in connection with installation of 110 kV to 33 kV transformer equipment at Bangalore. B.o.T. (Ref. CRE (IB) 67620/51).*

Sept. 18.—Uruguay. Six diesel generating sets of approx. 1,500 kW each required by Usinas Electricas y Telefonos del Estado B.o.T. (Ref. CRE (IB) 67188/51).*

Sept. 19.—Uruguay. Usinas Electricas y Telefonos del Estado wants two diesel generating sets of approx. 600 kW. B.o.T. (Ref. CRE (IB) 67187/51).*

Oct. 9.—Uruguay. Direccion General de Communicaciones invites tenders for a power amplifying unit for radio telegraphy on pure continuous wave to operate on bands between 8 and 24·4 Mc/s.

Oct. 15.—N. Rhodesia. Supply and erection of turbo alternator plant evaporators, power station switchgear, battery and cabling; steam raising plant; engine-room crane; circulating water pump, motor, spray cooling equipment and pipework. Documents from consulting engineer, J. S. Clinton, P.O. Box 4648, Johannesburg. Deposit £3 3s.

Oct. 18.—S. Africa. Supply of a total of nine electric motor driven swing jib cranes to various specifications for S. African Railways (Stores Dept.). Chairman of Tender Board, P.O. Box 7784, Johannesburg. B.o.T. (Ref. CRE (IB) 67589/51).*

Oct. 19.—Brisbane. Supply of street lighting equipment as follows: 1,000 lanterns, bracket type mounting for 100/120 W incandescent lamps, 250 same, suspension type mounting for same lamps, 100 lanterns, suspension type mounting for 250/400 W gas discharge lamps and 100 lanterns same mounting and lamps. B.o.T. (Ref. CRE (IB) 67312/51).*

Nov. 13.—Wellington (N.Z.). State H.-E. Department requires 4 single phase double wound transformer units, each 6667 kVA 66/6·35 kV outdoor type. B.o.T. (Ref. CRE (IB) 67457/51).*

Nov. 14.—India. Supply of power transformers, and outdoor switchgear for the Dam and Canal power houses as first stage in Tungbhadra H.E. scheme. Superintending Engineer (Technical), Govt. Electricity Dept., Madras. B.o.T. (Ref. CRE (IB) 67583/51).*

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	234 0 0	£220 0 0
LEAD, good soft pig (foreign)	180 0 0	136 0 0
" " " "English" quality	181 10 0	
Tin (99·99·75—) ... ...(Cash)	847-855	—
" (3 months)	820-824	—
ALUMINIUM, commercial purity (del.)	124 0 0	—
ZINC	190 0 0	140 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.)	55 5 0	—
Mild Steel Tape (0·04 in.)	32 5 0	—

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Igniscope. 696,662. Class 9. Apparatus for testing internal combustion engines. English Electric Co. Ltd., Queens House, Kingsway, W.C.2.

Parlavox. 699,226 and **Parlevox** 699,106. Class 9. Telephonic apparatus and sound amplifiers. Sir John Craven Carden, 3 Mount St., W.1.

Sobell with design 667,125, Class 9. Radio and television receiving sets and radio gramophones. Sobell Industries, Ltd., Langley Park, near Slough.

CONTRACTS PLACED

Bideford T.C. Provision and erection of street lighting equipment in district, Revo Electric Co., Ltd., £3,517.

Bournemouth T.C. Supply and erection of street lights in various roads, Revo Electric Co., Ltd., £4,158.

Dagenham. Electrical installation on Heath Park estate, Evans and Shea, Ltd., £4,041.

Hull T.C. Installation of electricity in 108 houses on Bilton Grange estate, and same at Scarborough St. school, Booker and Tarran Ltd., £4,702 and £1,680 respectively.

Leeds. Supply of switchgear and transformers for Knostrop Sewage Works, Yorkshire Electricity Board, £16,083.

Newcastle (Staffs) T.C. Provision of street lighting on estate roads, British Thomson-Houston Co., Ltd., £7,429.

Newcastle-on-Tyne. Provision of switchboard at General Hospital, Brush Electrical Engineering Co., Ltd., £1,277. Supply of 209 lamp columns for various estates, for T.C., Revo Electric Co., £2,034.

Peterborough. Electrical installation at new sewage purification works, City Electrical Co., Ltd., £3,599.

Sheffield. Supply of rectifier equipment for refuse disposal works, Yorkshire Electricity Board, £8,943.

Walsall T.C. Rewiring of council houses, Troughton and Young Ltd., £11,072.

TRADE NOTES

Change of Address. Pollard, Ray and Sampson Ltd., wholesale electrical distributors, have moved to 235 Imperial Drive, Harrow. Telephone Pinner 7983.

New Telegraphic address and phone Nos. The telegraphic address of the British Insulated Callender's Cables Ltd., Liverpool Branch, is now: Bicalbest, Liverpool, 1. The telephone number of the B.I.C.C. Branch at 48 Stoke Road, Shelton, Stoke-on-Trent, is now: Stoke-on-Trent 44256/7. The telephone number of the B.I.C. Construction Co. Ltd. Office at Clarence Chambers, Kingsway, Stoke-on-Trent, is now: Stoke-on-Trent 44368.

BUSINESS PROSPECTS

HOME

Blackley (Manchester) I.C.I. Ltd. (Dyestuffs) contemplate the rebuilding of premises at Crumpsall Lane.

Boldon (Durham) U.D.C. It is proposed to build another 54 houses on Lizard Lane site.

Carrickfergus T.C. Construction of 400 houses on Victoria estate. McCarthy and Lilburn, Chart. Surveyors, 47 Scottish Provident Buildings, Belfast.

Chatham. Plans in hand for conversion from gas to electric lighting at Glencoe Rd county primary school. Estimated cost £1,400.

Co. Down. Construction of county primary school at Ballynahinch. Quantity Surveyor, V. B. Evans, Provincial Bank Chambers, 3 Bradbury Place, Belfast.

Dudley T.C. Approval sought of revised plans for erection of secondary technical school. A school is also to be built in Buffery Road.

Dumfries. Dean of Guild Court has approved plans for 150 houses at Larchfield at estimated cost of £185,000.

Flints. Erection of junior and infants' school at Trenddyn. W. Griffiths, county architect, Llwynegrin, Mold.

Gateshead T.C. Plans approved for council offices as first instalment of scheme for new civic centre.

Glasgow. Dean of Guild Court has approved Council's plans to build 1,212 dwellings in the Barlanark district at an estimated cost of nearly £2 million. They will comprise flats in four-storey buildings, and the scheme will ultimately total 2,308 dwellings. Building is expected to begin shortly.

Gravesend. Scheme in hand for adaptation and equipment at electrical engineering laboratory at Technical College. Cost is estimated at £5,560.

Hartlepools T.C. Plans approved for infant school in Bruce Crescent.

Kent. Following schools to be included in next year's building programme: at Ashford Beaver Wood, Margate Birchington, Gravesend Southfields, and Folkestone county Technical for Girls.

Kerry (Eire). Erection of technical school at Dingle. Architect, J. R. Boyd-Barrett, 5 Camden Place, Cork.

Kettering T.C. Construction of 42 houses on the Grange estate. J. Patrick Haugh, Engineer and Surveyor, 3 Gold Street.

Leamington T.C. Plans are in hand for installation of electric light and fittings in houses in Tachbrook Rd. and Leicester St.

Lowestoft T.T. Construction of 50 houses in three groups on Whilton estate. Borough Engineer's Office, Town Hall.

Maidstone. Provision of improved lighting is planned in centre block of County Hall at an estimated cost of £2,470.

Malling (Kent) R.D.C. Erection of a further 34 houses at West Malling. Details from the Council Offices, West Malling.

March (Ely). New infants and junior schools are to be built in Maple Grove. Plans by County Architect, March, Cambs.

Middlesbrough T.C. Plans approved for 92 houses at Holmwood. Borough Engineer is J. A. Kenyon.

Newcastle-on-Tyne. Erection of 120 flats and maisonettes on Hindhaugh St. site. Also of 20 old people's dwellings on Montagu estate. City Architect, 18 Cloth Market. Also preliminary plans approved for Denton Sq. primary school to cost £155,000 and Rutherford grammar school costing £209,000. Tenders expected to be invited in October for construction of first part of 1,000 flats at Longbenton. Also, it is proposed to build a new secondary school in West Road.

Peterlee (Durham) T.C. Plans have been prepared by Peterlee Development Corporation for 444 houses at Eden Lane. Enquiries to City Architect's dept. of Corporation.

Preston T.C. Erection of 87 houses on the Larches estate. Borough Surveyor, Municipal Building.

Richmond (Surrey) T.C. Erection of 193 houses on Sandy Lane site. Borough Engineer, Hotham House, Heron Court.

Staffordshire. Building of county primary schools at Brickhouse Farm, Rowley Regis and Lichfield, has been approved.

Sunderland T.C. is likely to include the conversion from gas to electricity in 250 houses on Marley Potts estate, among next year's estimates. It was decided a short time ago to postpone scheme on financial grounds.

Surbiton T.C. It is proposed to build 6 flats and 12 bungalows on Hartfield Rd. site, and negotiations are in hand for erection of 32 flats in five blocks on Lovelace estate.

Tiverton T.C. Site works are now in progress for 68 houses at Cotteylands. Borough Surveyor, Town Hall.

Tynemouth. Borough Engineer is architect for Monkhouse county primary school and G. H. Gray, Camden St., North Shields, for secondary technical school estimated to cost £144,000.

West Sussex. Tenders expected to be invited shortly for construction of junior and infants' school at Shoreham.

Willenhall U.D.C. Erection of 66 houses on Clarkes Lane estate. Architect is R. T. Chappelle, Town Hall.

Wilmslow U.D.C. Construction of 74 houses at Lacey Green. A. J. Riley, Engineer and Surveyor, Council Offices, Green Hall.

Worthing T.C. Construction of 80 flats in Ivydore Ave., 52 in Ringmer Rd., and 20 in Warner Rd., in blocks of four. Borough Engineer and Surveyor, Town Hall.

York. Erection of 220 houses on Moor Lane estate, and also of 200 houses on Askam Lane estate. These are separate contracts and the former has also been subdivided into seven sections. City Engineer and Architect, C. J. Minter, Guildhall.

OVERSEAS

U.S.A. Quotations for switch gear and pale line hardware are sought by Ponsford - Moos Equipment Co., P.O. Box 321, 407 Bassett Tower, El. Paso, Texas.

Penn Machinery Co., P.O. Box 4298, Jackson, Mississippi, would like to receive quotations for transformers of various sizes. Interested firms should contact Mr. J. S. Penn at above address.

Also Power Electric Co., 1920, N. Mill St., Jackson, Mississippi, would like quotations (in dollars) for an electric

(Business Prospects continued)

motor, 200 h.p., 900 r.p.m., 3 phase, 220-440 V. Indication of delivery dates and catalogues also required. Communications should be addressed for attention of Mr. Jeff Hampton.

France. Societe d'Applications Thermiques et Mechaniques at 103 Rue Saint Lazore, Paris, want to represent U.K. manufacturers of public works equipment and handling and lifting appliances.

MEETINGS TO NOTE

TUESDAY, AUGUST 21
RADIO CONVENTION. Organised by British Instn. of Radio Engrs. Third part of their convention at King's College, Cambridge, until August 24.

WEDNESDAY, AUGUST 22
MODEL ENGINEER EXHIBITION at New Royal Horticultural Hall, Westminster until Sept. 1.

TUESDAY, AUGUST 28
NATIONAL RADIO AND TELEVISION EXHIBITION at Earls Court, London. Continues until Sept. 8.

THURSDAY, AUGUST 30
ENGNRG., MARINE AND WELDING EXHIBITION. Opens at Olympia, London, closing on Sept. 13.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Rotorcon Switchgear Ltd., 129a Courtney Rd., Woking. Electrical engineers and contractors, etc. Cap.: £100. Dirs.: S. Bowden, E. Bowden and A. G. Crough.

S. and C. Electrical Services Ltd., 120 St. Margarets Rd., Twickenham, Middlesex. Cap.: £2,000. Dirs.: W. F. Sansom and F. E. Capps.

Senior Radio Service Ltd., 82 London Rd., Headington, Oxford. Cap.: £4,000. Dirs.: G. Hoyle and Elsa M. Hoyle.

Telemystic Ltd., 5 Queens Gate, S.W.7. Hirers, renters, lessors and manufacturers of and dealers in advertising and display devices, equipment, signs, etc. Cap.: £100. Dirs.: H. P. Willcock and J. Neale.

L. H. S. Advertising Development Co., Ltd., Dale Cottage, Shellbridge Rd, Slindon Common, Sussex. Designers and manufacturers of and dealers in scintillating electric signs, neon, elec., magnetic, revolving, illuminated and other signs, etc. Cap.: £100. Permanent dirs.: F. D. Lynch, Mrs. J. M. M. Lynch, and F. Spickernell.

Rogers and Hall Ltd., 79 Marlowes, Hemel Hempstead, Herts. Contractors for electrical wiring, maintenance and installation of all kinds, etc. Cap.: £1,000. Dirs.: W. Hall and H. H. Rogers.

R. T. Electronics (Birmingham) Ltd., Station Rd., Knowle, Warwicks. Designers and manufacturers of and dealers in electric counting devices, measuring instruments, etc. Cap.: £100. Dirs.: P. H. Rock and C. A. Taylor.

Poole and Morgan Ltd., 15 North St., Leatherhead, Surrey. Mech., elec., consultant, research and general engineers, etc. Cap.: £2,000. W. T. Poole signs as director.

Riverside Accumulator Co., Ltd., 25-7 Mallinson Rd., Clapham Junction, S.W.11. To take over business carried on as "Riverside Accumulator Co." at 198 Parrock St., Gravesend. Cap.: £500. Permanent dirs.: A. M. Webb, A. Dadson, L. N. Barden, V. M. Todd and Yvonne Pearce.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

L. Goodman (Radio) Ltd., Tottenham Court Rd., W.1. Liquidator is Mervyn H. Bradbury, 10 Beauchamp Place, S.W.3, to whom creditors are asked to send particulars by Sept. 3.

Voluntary Liquidation

The Sherborne Electrical Co. Ltd., electrical and wireless engineers and retailers, Sherborne, Dorset. At statutory meeting of creditors it was reported that liabilities amounted to £896, of which £471 was due to unsecured creditors, and £425 to the debenture holder. Assets were estimated to produce £332. Resolution passed for appointment of E. B. Bate, 25, Baldwin St., Bristol, as liquidator, with a committee of inspection.

Partnership Dissolved

Worthing. Leonard F. Dalmon, Alice E. Dalmon and Stanley J. Dalmon, trading as "P. Dalmon and Sons," electrical engineers, at 60 Teville Rd., Worthing. Partnership dissolved as from Aug. 1. All debts will be received and paid by Alice E. Dalmon and Stanley J. Dalmon, who will continue the business.

Release of Liquidator

London. Alneco Ltd., manufacturers of electrical equipment, of 115 Sandpits, Birmingham. Liquidator was John M. Clarke, Official Receiver, Inveresk House, Strand, London, W.C.2.

Companies Winding-up

Philipp Clement Ltd., Charlotte St., W.1., retailers of electrical and radio goods. At first meeting of creditors, Official Receiver reported that winding-up order was made on June 25. Company was formed in Oct. 1949, with nominal capital of £100, all issued. The company carried on business as electrical engineers and retailers of television, radio and electrical goods. In addition it undertook installation of electrical apparatus and circuits. Accounts showed that up to Dec. 1950, a net loss of £1,195 was incurred on a turnover of £3,104. No statement of affairs had been filed but gross liabilities were stated to amount to £1,908, of which £31 was due to preferential creditors, £250 to the debenture holder, and £1,627 to unsecured creditors. Assets were valued at £200. Resolution passed for appointment of F. Goodman, 3, Broad St. Bldgs., E.C.2, as liquidator with committee of inspection.

BANKRUPTCY ACTS

Receiving Order

Wandsworth. Norman King Sanders, trading as King's Refrigeration Supplies Co. at 270 Wandsworth Rd., S.W.8. Date of receiving order, July 5.

Intended Dividends

Liverpool. Edna E. Jones, trading as "Edna Ward," lampshade manufacturer at 19 Duke St., Liverpool. Last day for receiving proofs is Aug 17. Trustee is Eric Stevenson Browne, 41 N. John St., Liverpool.

London. Leslie Oliver Richardson, electrical engineer, trading at 205 Railton Rd., Herne Hill. Last day for receiving proofs, Aug. 24. Trustee is William Foy Cresswell, Official Receiver, Bankruptcy Buildings, Carey St., W.C.2.

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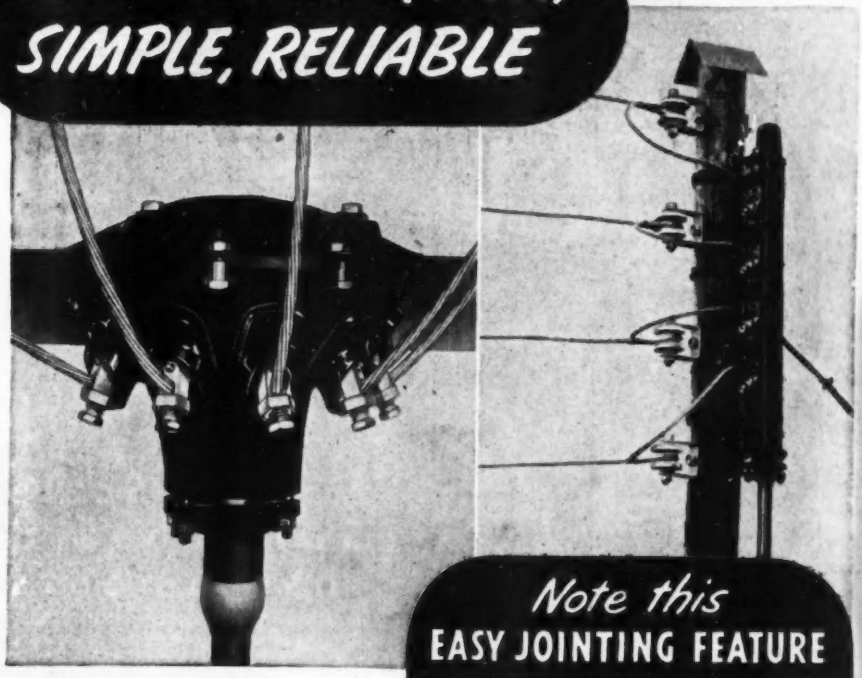

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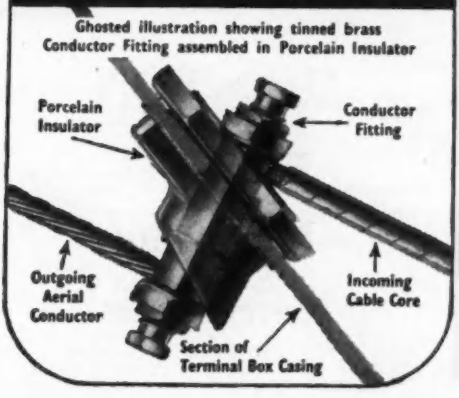
Ghosted illustration showing tinned brass Conductor Fitting assembled in Porcelain Insulator
Porcelain Insulator
Conductor Fitting
Outgoing Aerial Conductor
Incoming Cable Core
Section of Terminal Box Casing

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WESTON

Electrical Measuring Instruments

No. 4 . . . 6" Scale Switchboard Instruments

Weston 6" scale switchboard instruments combine the sensitivity of a laboratory instrument with the robust qualities necessary in a switchboard pattern. The range includes the Model S.57, which is supplied as a D.C. Microammeter, Milliammeter, Ammeter or Voltmeter. The S.58 which incorporates a thermocouple for the measurement of H.F. currents and is available as a Milliammeter or Ammeter. The Model S.59, incorporating a metal rectifier for the measurement of A.C., is supplied as a Milliammeter or Voltmeter and the Model S.60 is a Moving Iron Instrument for A.C. or D.C. measurement and is available as a Milliammeter, Ammeter or Voltmeter. The illustration shows the Model S.60 in the projecting type case. All models are available in either projecting or flush type moulded Bakelite cases. Further information and full details of the ranges supplied available on request.

SANGAMO WESTON LIMITED

Enfield, Middlesex. *Tel: Enfield 3434 (6 lines) & 1242 (4 lines).* *Grams: Sanwest, Enfield*

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. 0d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CITY OF NORWICH

Provision of Street Lighting

BIRMINGHAM-GREAT YARMOUTH TRUNK ROAD (A.1074), FARROW ROAD AND GUARDIAN ROAD

TENDERS are invited for the provision of street lighting on the above-mentioned roads.

The work consists of supplying and laying approximately 350 lineal yards of public lighting main; 44 lineal yards of service cable; providing, erecting and putting into service 21 reinforced concrete lighting columns and ancillary works.

The general conditions of contract recommended by the Institution of Electrical Engineers and the drawings may be seen and copies of the specification, schedule of prices and particulars and tender forms obtained at the City Engineer's Office, City Hall, Norwich, on payment of a deposit of £2 2s., which sum will be returned on receipt of a bona fide tender and the return of all the documents.

Tenders, endorsed "Tender for Street Lighting, Farrow Road and Guardian Road," and sealed in envelopes to be provided, which must bear no mark or indication of the sender, shall be delivered to the undersigned not later than 10 a.m. on Monday, August 27, 1951.

The Corporation do not bind themselves to accept the lowest or any tender.

H. C. ROWLEY, M.I.C.E.,
City Engineer.

City Hall, Norwich.
July 30, 1951. (L 589)

BINGLEY URBAN DISTRICT COUNCIL

Street Lighting Installation, Harden

TENDERS are invited for the supply, erection and installation of 34 street lighting columns, lanterns and auxiliary equipment for the above scheme.

Drawings may be seen and specification, bill of quantities and form of tender obtained from Mr. J. S. Lattin, M.I.Mun.E., A.M.T.P.I., Engineer and Surveyor, Town Hall, Bingley, upon payment of a deposit of two guineas, which will be returned on receipt of a bona fide tender not subsequently withdrawn. Cheques to be made payable to Bingley Urban District Council.

Tenders, in sealed envelopes endorsed "Street Lighting —Harden" and not bearing any mark indicating the sender, must be received by the undersigned not later than noon on Wednesday, September 5, 1951.

The Council do not bind themselves to accept the lowest, or any, Tender.

F. M. DUNWELL,
Clerk of the Council.

Town Hall,
Bingley, Yorks. (L 634)

CITY OF PETERBOROUGH

THE Council invites tenders from recognised electrical contractors for the Electric Lighting and Power Installations to 188 permanent houses on the Eastfield Estate, Peterborough.

Drawings, specifications and forms of tender may be obtained on application to Mr. F. J. Smith, M.B.E., A.M.I.C.E., City Engineer and Surveyor, Town Hall, Peterborough.

Applications, before noon on August 25, 1951, should be accompanied by a cheque for the value of £2 2s., made payable to the Peterborough City Council, which will be returned on receipt of a bona-fide tender or the return of the documents.

The Council does not bind itself to accept the lowest or any tender.

C. PETER CLARKE,
Town Clerk.

Town Hall, Peterborough
August, 1951. (L 660)

BOROUGH OF BASINGSTOKE

GROUP "A" STREET LIGHTING

TENDERS are invited for all the works in connection with the installation of a system of Group "A" fluorescent lighting within the shopping area of Basingstoke.

The extent of the works is as follows:—

(*a*) Supply and erection of 45 steel columns.

(*b*) Supply and erection of 2 wall brackets.

(*c*) Supply, erection and putting into service of 4 3 by 80W fluorescent tube lanterns.

(*d*) Removal of 39 existing tungsten filament lighting points.

Drawings and conditions of contract may be inspected at, and specifications, bill of quantities and forms of tender obtained from, the office of Mr. W. G. A. Clark, B.Sc., A.M.I.C.E., A.R.I.C.S., Borough Surveyor, Municipal Buildings, Basingstoke.

A deposit of £2 2s. should be forwarded when making application for contract documents (cheques to be made payable to Basingstoke Corporation). The deposit will be refunded on receipt of a bona-fide tender, together with specification and bill of quantities duly priced.

Tenders are to be submitted on the prescribed form, enclosed in a sealed envelope endorsed "Street Lighting", and are to reach the undersigned not later than the first post on Monday, September 3, 1951.

MEIRION O. JONES,
Town Clerk.

Municipal Buildings, Basingstoke.
August 10, 1951. (L 661)

COUNTY BOROUGH OF OLDHAM

Lighting Committee

TENDERS are invited for the supply of Concrete Lamp Columns and Electric Lanterns for Group "B" lighting in accordance with a specification which may be obtained on application to Mr. C. Worswick, Lighting Superintendnet, Gas Street, Oldham.

No tender will be accepted unless it is (*a*) received in a plain sealed envelope which shall not bear any mark or name indicating the sender; (*b*) endorsed "Tender for Lighting Equipment," and (*c*) addressed to the Chairman of the Lighting Committee, c/o The Superintendent, Lighting Department, Gas Street, Oldham, to be delivered not later than September 10, 1951.

The lowest or any tender will not necessarily be accepted.

The contract will be subject to the standing orders with respect to contracts.

EDWARD HAINES,
Town Clerk.

Town Hall, Oldham.
August 11, 1951. (L 659)

COUNTY BOROUGH OF SWANSEA

115 Houses at Penlan

TENDERS FOR ELECTRICAL INSTALLATION

ELECTRICAL engineers wishing to tender for the Electrical Installation for 115 houses at Penlan, Swansea, are invited to submit their applications to the Borough Architect, The Guildhall, Swansea, on or before September 1, 1951.

Plans, specifications and conditions of contract will be forwarded on application and deposit of two pounds, provided applicant gives satisfactory evidence of having previously carried out work of a similar character.

The deposit will be refunded after delivery of a bona-fide tender (which is not subsequently withdrawn) and the return of all documents. No guarantee is given that the lowest or any other tender will be accepted.

T. B. BOWEN,
Town Clerk.

Guildhall, Swansea.
August 13, 1951. (L 668)

BOROUGH OF WIDNES

STREET LIGHTING

TENDERS are invited for the supply and erection of 4·4 miles of Street Lighting to conform to the general requirements of the Ministry of Transport Departmental Committee's Final Report on Street Lighting, in particular, to the lighting of traffic roads (Group A).

Plans and general conditions of contract may be seen and copies of the specification, form of tender, and schedule of prices obtained on application to the Borough Engineer and Surveyor, Town Hall, Widnes.

Tenders are to be addressed to the Town Clerk, Town Hall, Widnes, and delivered to his office not later than first post on Thursday, September 6, 1951, enclosed in the envelope provided, endorsed "Tender for Street Lighting."

FRANK HOWARTH,
Town Clerk.

Town Hall, Widnes.
August, 1951. (L 635)

COUNTY BOROUGH OF BLACKPOOL

TENDERS are invited by the Corporation for the supply and delivery of the following STREET LIGHTING EQUIPMENT:

350 Concrete Columns, lanterns, choke sand capacitors for Group "A" lighting.
100 Concrete Columns, lanterns, chokes and capacitors for Group "B" lighting.
500 Synchronous Time Switches with Solar Dials.

The Corporation do not bind themselves to accept the lowest or any tender and may accept tenders for the whole or any part of the schedule.

Specifications, forms of tender and general conditions may be obtained from the Illuminations and Public Street Lighting Officer, Electrical Services Department, Rigby Road East, Blackpool. Separate tenders for each part are to be addressed to the undersigned and delivered in a plain sealed envelope endorsed in accordance with the instructions as stated on the forms of tender, not later than 10 a.m. Saturday, September 22, 1951.

TREVOR T. JONES,
Town Clerk.
(L 667)

APPOINTMENTS VACANT

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the appointment of SECOND ASSISTANT ENGINEER (Civil Engineering) Construction on the Divisional Headquarters Construction Staff, at a salary in accordance with the revised National Joint Board Agreement, Class "AX/CX," Grade 2 (£752-£938 per annum).

Applicants should possess a sound knowledge of reinforced concrete building work, surveying, and be capable of preparing specifications and bills of quantities. Preference will be given to candidates who are corporate members of the Institute of Civil Engineers.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Scheme.

Forms of application may be obtained from the Divisional Secretary at the address below to whom completed forms should be returned not later than August 31, 1951.

H. V. PUGH,
Divisional Controller.

British Electricity Authority,
Cardiff (Pengam Moors) Airport,
Cardiff. (L 682)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

CHIEF ENGINEER'S DEPARTMENT
AREA HEADQUARTERS

APPLICATIONS are invited for the position of SECOND ASSISTANT ENGINEER in the Technical Section.

Salary will be in accordance with the N.J.B. Revised Agreement, Schedule C, Class "AX/BX," Grade 2, and will commence at a point within the range £752-£911 per annum depending upon qualifications and experience. The appointment will be superannuable.

Candidates should have a sound general and technical education, preferably with a university degree, and corporate membership of the I.E.E. The post necessitates experience of urban and rural distribution systems and specialised experience in the design, installation and operation of protective gear. Duties will also include the carrying out of all necessary network calculations, and the preparation of reports and estimates.

Applications, stating age, qualifications, experience and present position should be addressed to the Chief Engineer, South East Scotland Electricity Board, 52 Melville Street, Edinburgh 3, within 14 days.

THOMAS J. MULLAN,
Secretary.

52 Melville Street, Edinburgh 3. (L 647)

BRITISH ELECTRICITY AUTHORITY

South Western Division

TECHNICAL STAFF VACANCIES
PLYMOUTH "B" GENERATING STATION

APPLICATIONS are invited for the following superannuable appointments at the new Plymouth "B" Generating Station, Plymouth, Devon.

In the first instance the station will have a capacity of 94·5 MW and will ultimately be increased to 189 MW.

(a) DEPUTY POWER STATION SUPERINTENDENT—Grade 3, Class "G," £885 to £927 per annum.
(b) EFFICIENCY ENGINEER—Grade 7, Class "G," £651 to £679 per annum. This grade is provisional and subject to approval by the District and National Joint Board.
(c) MAINTENANCE ENGINEER (Mechanical)—Grade 6, Class "G," £707 to £737 per annum.
(d) MAINTENANCE ENGINEER (Electrical)—Grade 6, Class "G," £707 to £737 per annum.
(e) SHIFT CHARGE ENGINEER—Grade 7, Class "G," £651 to £679 per annum.
(f) ASSISTANT SHIFT CHARGE ENGINEER—Grade 9, Class "G," £571 to £597 per annum.
(g) BOILER HOUSE SHIFT CHARGE ENGINEERS—Grade 9, Class "G," £571 to £597.
(h) STATION SHIFT CONTROL ENGINEERS—Grade 10, Class "G," £539 to £561.

Candidates for (a) should have had a good technical education and considerable practical experience in the operation, maintenance, and administration of a large generating station equipped with P.F. fired boilers and should preferably be corporate members of one of the recognised engineering institutions.

Candidates for (b) should be experienced in the operation of a modern generating station and familiar with heat flow, boiler and turbine testing, compilation of statistical data, and all matters appertaining to the economical operation of a generating station.

Candidates for (c) and (d) should be associate members of the appropriate engineering institution or possess equivalent technical qualifications. A wide experience in the maintenance of modern generating station plant is essential.

Candidates for (e) must have had considerable experience in a modern generating station equipped with P.F. fired boilers. Preference will be given to candidates who are corporate or graduate members of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers or who hold equivalent qualifications.

Candidates for (f) and (g) should have had a sound technical training, with practical experience in the operation and control of modern generating plant with P.F. fired boilers.

Candidates for (h) should have had a sound technical training and have had experience in the operation of e.h.t. switchgear and load control of turbo alternators.

Applications, stating age, qualifications, present appointment and salary, and full details of education and experience, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than August 31, 1951. Envelopes and applications should be clearly endorsed with the appointment sought.

R. C. BARRETT,
Divisional Secretary.

August 7, 1951. (L 623)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

GENERAL ASSISTANT ENGINEERS (PROTECTION)

APPLICATIONS are invited for the appointment of General Assistant Engineers (Protection) in the Divisional Technical Department.

Successful candidates will be employed as assistants to the Regional Engineers at either Nottingham, Leicester or Coventry.

The salary will be in accordance with the National Joint Board Agreement, Schedule "C," Grade 8, Class "AX/DX" (£437-£622). The commencing salary will depend upon qualifications and experience.

The appointment will be superannuable within the provisions of the British Electricity Authority and Area Boards' Superannuation Scheme.

The minimum technical qualification required is the Higher National Certificate in Electrical Engineering. Preference will be given to candidates who have completed a recognised post-graduate apprenticeship, and experience of high voltage switchgear and protective gear will be an advantage.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned not later than August 25, 1951.

L. F. JEFFREY,
Divisional Controller.

July 26, 1951. (L 568)

BRITISH ELECTRICITY AUTHORITY

North Eastern Division

NORTH TEES "C" POWER STATION

APPLICATIONS are invited for the following appointments which will be made during the present year at North Tees "C" Power Station, Billingham-on-Tees.

(1) STATION CHEMIST—Grade 7, Class "J" (£736-£770).

(2) FIRST ASSISTANT STATION CHEMIST Grade 9, Class "J" (£646-£674).

Applications for both appointments should have had experience in modern power-station laboratories covering the analysis of fuel water and oil and be conversant with water treatment and fuel sampling. A University Degree in Chemistry or A.R.I.C. is preferable but candidates with a Higher National Certificate in Chemistry, followed by a recognised course of study will be considered.

Superannuation will be in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

The local authorities housing programme takes into account the commissioning of new industrial works in the area and the successful applicants will receive consideration for the tenancy of council houses allocated to these works.

Forms of application may be obtained from the Divisional Secretary (Establishments), British Electricity Authority, North Eastern Division, Carliol House, Newcastle-upon-Tyne, to whom they should be returned to arrive not later than August 31, 1951. (L 640)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

APPLICATIONS are invited for the appointment of ASSISTANT SHIFT CHARGE ENGINEER at the Percival Lane Power Station, Runcorn. The salary £571/£597 per annum, Class "G," Grade 9, of the N.J.B. Agreement.

Candidates should have had a good general education and experience in the shift operation of generating plant. The possession of a Higher National Certificate or similar qualification would be an advantage.

The appointment will be superannuable under the British Electricitv Authority and Area Boards' Superannuation Scheme, and may be subject to a medical examination.

Forms of application may be obtained from the Divisional Secretary, Clarke Gardens, Woolton, Liverpool, and should be returned to him not later than Friday, August 31, 1951.

A. R. COOPER,
Divisional Controller.
(L 632)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of COMMERCIAL ASSISTANT based on Llandudno, at a salary in accordance with Class D/11 of the N.J.B. Agreement (£436/452 per annum).

Applicants should have had an engineering training experience in dealing with installation work consumer's supply inquiries, and general commercial duties. A knowledge of DC/AC changeover procedure would be an advantage.

The appointment will be superannuable and subject to medical examination.

Applications, on forms available from the Manager, No. 4/5 Sub-Area, Merseyside and North Wales Electricity Board, Department 429A, Electricity House, Rhostyllen, Wrexham, should be returned not later than August 24, 1951.

JAMES RANKIN,
Secretary.
(L 641)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

CHEMIST, STAYTHORPE

APPLICATIONS are invited for the post of Chemist at Staythorpe Generating Station.

Candidates should have had a good experience in modern power station laboratory work, covering analysis of fuel, water and oil, be thoroughly conversant with water softening and treatment and have some knowledge of problems relating to corrosion and boiler fouling.

Salary for this appointment will be within Grade 7, Class "J" of the N.J.B. Salary Scale and the post will be superannuable within the terms and conditions of the B.E.A. and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, Barker Gate, Nottingham, and should be returned not later than September 4, 1951.

L. F. JEFFREY,
Divisional Controller.
August 9, 1951. (L 652)

CORPORATION OF LONDON

APPOINTMENT OF
ELECTRICAL ENGINEERING ASSISTANT

APPLICATIONS are invited for the appointment of Assistant Electrical Engineer in the office of the City Surveyor.

Candidates should have served a full-time engineering apprenticeship and have experience in design of electrical installations for public buildings, etc., the preparation of specifications and drawings and the supervision of contracts. The possession of a Higher National Certificate in Electrical Engineering is an essential qualification and Corporate Membership of the Institute of Electrical Engineers would be considered an advantage.

The appointment is in the range of Higher Grade I, £400 by £25 to £625, commencing salary to be subject to age, experience and qualifications. The first £400 of the salary is subject to 15% and the remainder 7½% cost-of-living bonus.

The appointed officer will require to pass a medical examination and to contribute to the Corporation's Superannuation Fund as maintained under the City of London (Various Powers) Act, 1931 and 1950.

Applications, giving full personal details, particulars of qualifications, experience, age, past and present appointments, and the names of two persons to whom reference may be made, should be sent to the City Surveyor, Corporation of London, 55-61 Moorgate, London E.C.2, not later than August 27. (L 569)

MIDLANDS ELECTRICITY BOARD

APPOINTMENT OF THIRD ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the above position in the Leominster District of the Shropshire and Herefordshire Sub-Area.

Applicants should have had experience in all branches of distribution work, including erection, operation and maintenance of high and low voltage cables, overhead and underground mains, substations, etc. Appropriate technical qualifications will be considered an advantage.

Conditions of service will be in accordance with the National Joint Board Agreement, and the provisional salary will be Class "B," Grade 9, £433-£455 per annum.

Applications, stating age, present salary, full particulars of experience and present position, should be forwarded within fourteen days to Mr. W. Winwood, Manager, Shropshire and Herefordshire Sub-Area, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.
August 3, 1951. (L 631)

KENT COUNTY COUNCIL

APPLICATIONS are invited for the following appointments in the Buildings Department:—

(1) ENGINEERING INSPECTOR in A.P.T. Grade 5 (£570 to £620).

(2) ENGINEERING ASSISTANT (Electrical) in A.P.T. Grades 1 to 3 (£440 to £545).

Applicants for (1) must have had good practical experience in the design and installation of equipment in one or more of the following, viz.: (a) electrical installations for buildings; (b) low-pressure hot-water heating, and domestic hot and cold water systems; (c) steam services associated with heating and cooking installations.

Preference will be given to members of the Institution of Heating and Ventilating Engineers or the Institution of Electrical Engineers.

Applicants for (2) must be capable draughtsmen, with practical experience in electrical installation work, and should preferably be graduate members of the Institution of Electrical Engineers.

Applications, on forms obtainable from the County Architect, Springfield, Maidstone, must be delivered to him within 14 days of the appearance of this advertisement.

W. L. PLATTS,
Clerk of the County Council.
County Hall, Maidstone.
August 7, 1951. (L 626)

CITY OF PORTSMOUTH

City Engineer's Department

APPLICATIONS are invited for the appointment of ASSISTANT ENGINEER (Electrical). Salary in accordance with Grade A.P.T. 5 (£570 to £620 per annum).

Candidates should have had a thorough training in electrical engineering, be fully competent to prepare specifications and supervise all types of electrical work, and have had experience in the design and maintenance of street lighting by electricity.

Applications, stating age, full details of training, qualifications, and experience, and whether applicant can drive a motor-car, must reach the City Engineer at the address below not later than 12 noon on Wednesday, August 29, 1951.

Canvassing will disqualify.

V. BLANCHARD,
Town Clerk.
City Council Chambers,
1 Clarence Parade, Portsmouth.
August 4, 1951. (L 629)

ELECTRICITY SUPPLY COMMISSION

Southern Rhodesia

VACANCIES

DISTRICT ENGINEERS

Grade 2. Salary scale, £798 by £31 10s. to £892 10s.
Grade 1. Salary scale, £924 by £31 10s. to £1,050.

The salaries quoted are basic and carry a cost-of-living allowance, at present standing at approximately 35 per cent.

Applications are invited from persons who have held similar positions with a bulk supply electricity undertaking operating a large rural transmission and distribution system, and who are familiar with the operation and maintenance of automatic on-load-tap changing transformers and auto-reclosing switchgear up to 132 kV; experience in dealing with consumers' correspondence, accounts, staff and office routine essential; minimum technical qualifications, A.M.I.E.E. or equivalent.

Appointments will be subject to the production of a satisfactory medical certificate and applicants must be prepared to serve anywhere in Southern Rhodesia.

Details of leave, etc., may be had on application, and the successful applicants will be subject to the Commission's service bye-laws, Holiday Fund, and Medical Aid Society regulations, and a child allowance is payable where applicable.

Applications, giving full details of experience, stating age, marital state, and number of children, and accompanied by *copies* of testimonials, should reach the Secretary, P.O. Box 377, Salisbury, not later than September 15, 1951. (L 628)

BRITISH ELECTRICITY AUTHORITY

South Western Division

ENGINEERING DRAUGHTSMEN
TRANSMISSION DEPARTMENT—BRISTOL

APPLICATIONS are invited for the following vacancies in the Construction Section of the Transmission Department Drawing Office in Bristol.

(a) Senior Draughtsman (Electrical) Grade 5, £500-£600 per annum.
(b) Engineering Draughtsman (Electrical) Grade 6, £375-£500 per annum.

The general conditions of employment will be in accordance with the National Joint Board Agreement and the commencing salaries will be according to qualifications and experience within the scales quoted.

Candidates for both appointments, which are superannuable, must be experienced in the preparation of the layout of 132 KV and/or 33 KV outdoor substations and their associated equipment and have a good general knowledge of control and protective circuits. Experience in the preparation of switchgear diagrams and/or building and site works would be considered an advantage.

Candidates for (a) must also be capable of supervising the work of detail draughtsmen engaged on the duties outlined above.

Applications stating post applied for, age, qualifications and full details of education, training and experience should be addressed to the Divisional Secretary, British Electricity Authority, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than August 27, 1951.

R. C. BARRETT,
Divisional Secretary.

August 7, 1951. (L 624)

UGANDA ELECTRICITY BOARD

ACCOUNTANCY ASSISTANTS

THE Uganda Electricity Board invite applications to fill three appointments as Accountancy Assistants. Applicants should have had a sound education and experience in electricity supply organisations.

The commencing salary, to be decided according to qualifications and experience, will be within the scale £500 by £40 to £780, and a temporary allowance of 15 per cent. of salary will be payable in addition for so long as the Board may decide.

Rent-free housing accommodation (partly furnished) or an allowance in lieu, free medical and dental treatment for self and family, and free passages to and from Uganda up to the equivalent of three adult passages, will be provided. First contract will be for three years with 90 days vacation leave (or 180 days if contract is renewed) at the end thereof on full salary. Local leave may also be granted up to a total of 36 days during the period of the contract.

Provident and Pension Schemes are applicable.

Forms of application, obtainable from the Board's London Office, 129 Grand Buildings, Trafalgar Square, London W.C.2, are to be completed and addressed to the undersigned and posted so as to reach Kampala not later than one month from the date of publication of this notice.

C. R. WESTLAKE,
Chairman.

P.O. Box 559, Kampala,
Uganda, East Africa.
August 1, 1951. (L 607)

LONDON ELECTRICITY BOARD

ENGINEER (CONSTRUCTION)

APPLICATIONS are invited for the above position in the Construction Branch of the North Eastern Sub-Area at Stratford, E.15.

Applicants should have had a sound technical education, be Corporate Members of the I.E.E. and possess good practical experience in electricity distribution, particularly underground cable systems, both h.v. and m.v., in heavy industrial and residential areas. In addition to having the necessary technical and practical knowledge of construction work, they should also possess the necessary administrative ability and knowledge of the working conditions and rates applicable in the electricity supply industry.

The post is graded under the National Joint Board Agreement (February 17, 1950) as Class "K", Grade 7—£825 6s. per annum, rising to £863 2s. per annum inclusive of London Area Allowance.

Application forms, obtainable from Establishments Officer, 46 New Broad St., E.C.2, on receipt of addressed foolscap envelope, should be returned duly completed within seven days of the receipt thereof. Please quote Ref.: EST/V/1295/T, on all correspondence. (L 657)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the appointment of POWER STATION SUPERINTENDENT at Hams Hall "B" Power Station (321 MW capacity) in accordance with Class "K," Grade 1 of the National Joint Board Agreement, commencing salary £1,310 per annum.

Candidates should possess either a University Degree in Engineering or be corporate members of both the Institutions of Electrical and Mechanical Engineers, or hold equivalent qualifications. They should have a wide knowledge of large power station operation, and in particular should have experience of pulverised fuel firing. Sound administrative ability is essential.

Conditions of service will be in accordance with the N.J.B. Agreement and superannuation under terms approved by the British Electricity Authority.

Applications should be addressed to the Divisional Secretary, British Electricity Authority, 53 Wake Green Road, Moseley, Birmingham 13, and should be received not later than September 1, 1951.

F. W. LAWTON,
Divisional Controller.
(L 650)

COUNTY BOROUGH OF DONCASTER

Works Department

APPLICATIONS are invited for the position of ELECTRICAL ASSISTANT in the above Department, at a salary in accordance with Grade A.P.T.V.(a) of the National Scales of Salaries (£600 rising to £660).

Candidates must have had practical experience of domestic and industrial installation work and be capable of preparing estimates and specifications and supervising the carrying out of electrical installations and maintenance work in municipal buildings, works, schools and new housing schemes.

Candidates should also have had experience of street lighting work and will be responsible, under the Borough Surveyor, for works of installation and maintenance of street lighting both electricity and gas.

Education standard should be equivalent to matriculation, and applicants should possess the Higher National Certificate in Electrical Engineering.

Written applications, stating age, education, qualifications and full details of experience, accompanied by copies of two recent testimonials, should reach the undersigned not later than August 25, 1951.

H. S. ESSENHIGH,
Town Clerk.

Town Clerk's Office,
1 Priory Place, Doncaster.
August 3, 1951 (L 606)

LONDON ELECTRICITY BOARD

DRAUGHTSMAN

APPLICATIONS are invited for the above position in the North Western Sub-Area.

Candidates should be experienced in the following in relation to distribution systems up to 11 kV: (a) Plant and cable layout work; (b) Diagrams; (c) Cable surveys and wayleaves.

The commencing salary, which is provisional, pending agreement with the appropriate negotiating organisations, will be in accordance with qualifications and experience and will be within the range £300-£500 per annum inclusive.

Application forms obtainable from Establishments Officer, 46 New Broad Street, E.C.2, on receipt of addressed foolscap envelope, to be returned duly completed within 7 days. Please quote Ref. EST/V/1296/T. on envelope and all correspondence. (L 658)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Ayrshire Sub-Area

APPOINTMENT OF SENIOR ASSISTANT ENGINEER (Operation and Maintenance)

APPLICATIONS are invited for the above appointment on the technical staff at Sub-Area Headquarters, Kilmarnock.

Applicants should have received a sound technical and practical training, with long and comprehensive experience in the operation and maintenance of overhead and underground networks and sub-station equipment up to and including 33 kV.

Applicants should preferably be corporate members of the Institution of Electrical Engineers or hold equivalent qualifications.

Salary in accordance with the National Joint Board Agreement, Class "G," Grade 4, £821 to £859 per annum, subject to deductions, including income tax and superannuation.

Applications, stating age, qualifications, with full details of education, training, experience, and present position, to be sent to the Manager, The South West Scotland Electricity Board, Greenholm Street, Kilmarnock, within 14 days of the appearance of this notice.

A. E. ROOTS,
Manager.

August 8, 1951. (L 627)

BRITISH ELECTRICITY AUTHORITY

South Western Division

ASSISTANT SHIFT CHARGE ENGINEER—HAYLE GENERATING STATION

APPLICATIONS are invited for the position of Assistant Shift Charge Engineer at Hayle Generating Station.

Applications should have good technical qualifications and a sound knowledge of the operation and maintenance of generating plant.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Class "F," Grade 9, £538-£560 per annum.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Applications, stating age, qualifications, experience, present position and salary should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than August 24, 1951.

R. C. BARRETT,
Divisional Secretary.

August 9, 1951. (L 649)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

POST OF AREA MANAGER, ABERDEEN

APPLICATIONS are invited for the position of Area Manager of the Board's Aberdeen Area which will become vacant at the end of 1951. Candidates should be fully qualified engineers with practical experience in administration, operation and maintenance connected with the generation and distribution of electricity in an electricity supply undertaking. Commercial ability essential. Salary in accordance with qualifications and experience. Superannuation scheme applicable.

Application form obtainable from the Secretary, 16 Rothesay Terrace, Edinburgh 3, should be returned within 21 days of the appearance of this advertisement. (L 630)

BRITISH ELECTRICITY AUTHORITY

South Western Division

STATION CHEMIST
PLYMOUTH "A" AND PLYMOUTH "B" GENERATING STATIONS

APPLICATIONS are invited for the superannuable appointment of Station Chemist for Plymouth "A" and the new Plymouth "B" Generating Stations, based at Plymouth "B."

Plymouth "A" has a capacity of 65.7 MW. Plymouth "B," in the first instance, will have a capacity of 94.5 MW and will ultimately be increased to 189 MW.

The salary will be in accordance with Grade 7, Class "H" of the N.J.B. Agreement, £692 to £722 per annum.

Candidates should possess a degree in chemistry and have had experience in the testing of fuels, oil, and water. They should also be familiar with and capable of taking part in investigations and carrying out performance tests.

Applications, stating age, qualifications, present appointment, and salary, and full details of education and experience, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than August 31, 1951. Envelopes containing applications should be endorsed "Station Chemist—Plymouth."

R. C. BARRETT,
Divisional Secretary.

August 7, 1951. (L 622)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment:

ASSISTANT SHIFT CHARGE ENGINEER, Brimsdown Generating Station.

Salary in accordance with the revised N.J.B. Schedule "A," Grade 9, Class "J" (£646-£674 per annum, plus London weighting).

Applicants should have had good practical and technical training and possess experience in the operation of a modern generating station. Experience in the operation of plant at high steam pressure is essential.

Qualifications equivalent at least to Ordinary National Certificate Standard will be necessary.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, experience and present position should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than August 24, 1951. Envelopes should be endorsed "Assistant Shift Charge Engineer, Brimsdown."

W. N. C. CLINCH,
Controller.

Northmet House,
Southgate, N.14. (L 651)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

ASSISTANT CHEMIST, STAYTHORPE

APPLICATIONS are invited for the post of Second Assistant Chemist at Staythorpe Generating Station.

Applicants should have had practical experience in the analysis of coal, water, oil, etc., for power station requirements. Preference will be given to candidates possessing the Higher National Certificate in Chemistry or equivalent qualifications.

The salary for this appointment will be in accordance with Class "J," Grade 11 of the N.J.B. Scale, and the post will be superannuable within the provisions of the B.E.A. and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and be returned not later than September 4, 1951.

L. F. JEFFREY,
Divisional Controller.

August 10, 1951. (L 653)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for appointments as GENERAL ASSISTANT ENGINEERS in the System Operation Department, Thames Grid Control Area at Paternoster Square Grid Control Centre.

Applicants should have had practical training and have technical qualifications up to Graduate I.E.E. standard.

The commencing basic salary will be within the range, £437 rising to £569 plus a London Allowance of 5 per cent. with a minimum of £25 per annum. This salary is in accordance with Class "AX," Grade 8 of the N.J.B. Schedule and is subject to an ultimate maximum in Class "EX" of £641 plus 5 per cent. London Allowance.

The position is superannuable.

Applications stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within 15 days of the publication of this advertisement.

J. N. WATE,
Divisional Controller.
(L 654)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the position of ASSISTANT SHIFT CHARGE ENGINEER at Stourport "A" and "B" Generating Station. Salary will be in accordance with Class "J," Grade 9 of the National Joint Board Agreement, commencing at £646 per annum.

Applicants should possess the Higher National Certificate in Electrical and/or Mechanical Engineering, or an equivalent qualification, and should have had experience in the operation of modern high-pressure boilers and turbo-alternators. A knowledge of pulverised fuel firing would be an advantage.

Conditions of service will be in accordance with the N.J.B. Agreement, and superannuation under terms approved by the British Electricity Authority.

Forms of application may be obtained from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and should be returned not later than September 1, 1951.

F. W. LAWTON,
Divisional Controller.
(L 655)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

APPLICATIONS are invited for the following positions:

Croydon "B" Power Station

1. ASSISTANT ENGINEER (EFFICIENCY AND PLANT TESTING)

Candidates, who would preferably possess Higher National Certificate, will be required to assist in maintaining efficient plant operation, in plant testing and investigation, and in the maintenance of operation records. Salary Class "J," Grade 9, £646 p.a.

Croydon "A" Power Station

2. JUNIOR ENGINEER (EFFICIENCY)

Candidates should preferably possess Higher National Certificate and should have had good engineering experience either in a power station plant manufacturer's works or in power station operation. The duties will include assisting in investigations, plant testing and station statistics. Salary Class "F," Grades 15/14, commencing at £375 p.a.

Kingston "B" Power Station

3. ASSISTANT ENGINEER (EFFICIENCY)

Candidates should possess at least Higher National Certificate, preferably in mechanical engineering. The successful applicant will be responsible to the Station Superintendent for the efficiency of the power station plant and for plant testing and investigation. Salary Class "G," Grade 6, £707 p.a.

Littlebrook Power Station

4. ASSISTANT ENGINEER (OPERATION AND EFFICIENCY)

Candidates should preferably possess a university degree in engineering or corporate membership of the Institution of Electrical or Mechanical Engineers. Candidates with Higher National Certificate in Electrical or Mechanical Engineering or who hold an equivalent qualification will be given consideration. The successful applicant will be responsible to the Station Superintendent for the efficient operation, technical investigations and plant testing of the power station plant. Salary Class "J," Grade 5, £857 p.a.

5. JUNIOR ENGINEER (OPERATION AND EFFICIENCY)

Qualifications and duties as in Vacancy No. 2 above. Salary Class "J," Grades 18/14, commencing at £375 p.a.

6. JUNIOR ENGINEER (CONTROL)

Applicants should have had suitable training and experience in the operation of e.h.t. switchgear and parallel running of alternators. Salary Class "J," Grades 18/14, commencing at £375 p.a.

Divisional Headquarters

7. THIRD ASSISTANT ENGINEERS (OPERATION)

Candidates should have been educated to Higher National Certificate Standard preferably in mechanical engineering. The successful applicants will be required to work in the Divisional Test, Efficiency and Statistical Sections and their duties will include carrying out station investigations and investigations on plant performance and on plant improvements. Salary Class "AX/CX," Grade 5, commencing £579-£710 p.a. and rising to £753 p.a.

8. ASSISTANT DIVISIONAL CHEMIST

Candidates should preferably possess B.Sc. or A.R.I.C. degrees. Experience in fuel testing, water analysis and lubricating oils is essential, and experience of modern power station installations an advantage. Salary Class "AX/CX," Grade 5, commencing £579-£710 p.a. and rising to £753 p.a.

9. SENIOR DRAUGHTSMAN (ELECTRICAL)

Applicants should have had experience of power station design, layout and construction and should preferably be educated to Higher National Certificate standard. Salary schedule "D," Grade 5, £500-£600 p.a.

All salaries are subject to addition of London allowance, N.J.B. conditions of service.

Applications, on forms obtainable from Divisional Secretary, British Electricity Authority, South Eastern Division, Lower Ham Road, Kingston-on-Thames, should be returned completed by August 25, 1951. (L 625)

SOUTH EASTERN ELECTRICITY BOARD

Area Board Headquarters

SENIOR DRAUGHTSMAN

SALARY £500 p.a. to £600 p.a. under N.J.B. Schedule D, Grade 5. Superannuation will be arranged. Applicants should have had a good technical training and drawing office experience in the electrical design and layout of outdoor and indoor substations up to and including 33,000 V. Possession of the Ordinary and/or Higher National Certificate will be an advantage.

Applications, giving two referees, must reach the Engineer-in-Chief, South Eastern Electricity Board, 10 Queen's Gardens, Hove 3, Sussex, by August 27, 1951.

A. L. BURNELL,
Secretary.

August, 1951. (L 648)

NORTH WESTERN ELECTRICITY BOARD

No. 3 Sub-Area

APPOINTMENT OF FIRST ASSISTANT DISTRICT ENGINEER, ROCHDALE DISTRICT.

APPLICATIONS are invited for the appointment of First Assistant District Engineer in the Rochdale district of the No. 3 Sub-Area.

The salary for the post will be in accordance with the National Joint Board Revised Schedule, Class "F," Grade 4, i.e., £767/£785/£803 per annum. The post is superannuable.

The Engineer appointed will be required to give assistance to the District Engineer with relation to the following :—

Operation and maintenance of high and low voltage networks (overhead and underground);
Operation and maintenance of sub-stations;
Supervision of constructional work;
The keeping of technical records;
General maintenance of supply and such other matters as may be necessary.

The successful candidate will be required to undertake standby duty.

Preference will be given to applicants who are Corporate Members of the Institution of Electrical Engineers or who hold exempting qualifications.

APPOINTMENT OF THIRD ASSISTANT ENGINEER (OPERATION AND MAINTENANCE).

Applications are invited for the appointment of Third Assistant Engineer (Operation and Maintenance) on the engineering staff at the No. 3 Sub-Area Headquarters, Union Street, Oldham.

The salary for the post will be in accordance with Class "K," Grade 10 of the National Joint Board Revised Agreement, i.e., £646/£660/£674 per annum.

Applicants should have had a wide experience in the operation and maintenance of large industrial and rural high voltage and low voltage networks, including both overhead lines and underground cables of voltages up to and including 33 kV; also experience in high voltage testing and fault localising.

Graduate membership of the Institution of Electrical Engineers or exempting qualifications will be an advantage.

Applications for the above posts, stating age, education, qualifications and experience, present post and salary, should be received by E. Binns, Esq., M.I.Mech.E., A.M.I.E.E., Sub-Area Manager, No. 3 Sub-Area Headquarters, The North Western Electricity Board, Union Street, Oldham, not later than Saturday, August 25, 1951.

No. 4 Sub-Area

APPOINTMENT OF SECOND ASSISTANT DISTRICT ENGINEER.

Applications are invited for the appointment of Second Assistant District Engineer in the 4D—South West Fylde District, Blackpool, of the No. 4 Sub-Area.

The successful candidate will be required to assist in the construction and maintenance of sub-stations and overhead lines, the laying and jointing of cables on high and medium voltage mains, and the operation and control of switching in the district, including standby duty.

Preference will be given to applicants who are Corporate Members or Graduates of the Institution of Electrical Engineers, or who hold equivalent qualifications.

The salary for the post will be in accordance with the National Joint Board Schedule, Class "F," Grade 7, i.e., £625/£634/£643 per annum.

Applications stating age, qualifications, experience, present post and salary, should be received by the Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune Street, Preston, not later than Saturday, August 25, 1951.

No. 7 Sub-Area

APPOINTMENT OF ENGINEERING DRAUGHTSMAN, "C" DISTRICT—NEW MILLS.

Applications are invited for the appointment of Engineering Draughtsman in the Mains Drawing Office at "Thornfield," Spring Bank, New Mills.

Applicants should have had a suitable technical education and a good drawing office training. Practical experience of sub-station layouts, mains records and the preparation of overhead line profiles will be an advantage.

The salary for the post will be in accordance with Grade 6 of Schedule "D" of the National Joint Board Agreement, i.e., £375/£500 per annum. The commencing salary will be fixed according to qualifications and experience.

Applications, stating age, education, training and experience, present post and salary, should be received by F. J. Cole, M.I.Mech.E., M.I.E.E., Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Electricity Offices, Chapel Street, Hazel Grove, Cheshire, not later than Saturday, August 25, 1951. (L 638)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

ASSISTANT MAINTENANCE ENGINEER (MECHANICAL), LEICESTER POWER STATION

APPLICATIONS are invited for the appointment of Assistant Maintenance Engineer (Mechanical) at Freemen's Meadow Generating Station, Leicester.

Candidates should have served an engineering apprenticeship and have had good practical experience, including erection or maintenance of turbines. Technical training and qualifications will be an advantage.

The salary is in accordance with the N.J.B. Schedule, Class "H," Grade 8, £644-£672 per annum, and the position will be superannuable under the terms and conditions of the British Electricity Authority and Area Boards' superannuation scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity House, Barker Gate, Nottingham, and should be delivered to the undersigned not later than August 29, 1951.

L. F. JEFFREY,
Divisional Controller.

August 3, 1951. (L 633)

LONDON ELECTRICITY BOARD

DRAUGHTSMEN

APPLICATIONS are invited for positions as Draughtsmen in the architect's section of the Chief Engineer's Department in Central London.

Applicants should be neat draughtsmen and preferably have had several years' experience in an architect's office.

Pending grading of the posts under the national agreement of the appropriate negotiating body, the commencing salary will be from £400 per annum inclusive, according to qualifications and experience.

Application forms, obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be returned completed within 10 days. Please enclose addressed foolscap envelope and quote Ref. EST/V/1256/T. on all correspondence. (L 656)

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO, CANADA

APPLICATIONS are invited for the following appointments at R. L. Hearn and J. Clark Keith Generating Stations, Toronto and Windsor. Ultimate capacities 400 MWs and 240 MWs.

(a) ASSISTANT STATION SUPERINTENDENT, Toronto. Salary range, 6,000-7,400 dollars per annum.

(b) EFFICIENCY ENGINEERS, Toronto and Windsor. Salary range, 5,370-6,640 dollars per annum.

(c) MECHANICAL ELECTRICAL MAINTENANCE ENGINEER, Windsor. Salary range, 5,370-6,640 dollars per annum.

Applicants for (a) should possess wide experience in administration, operation and maintenance of modern h.p. turbines, boilers and electrical equipment of large capacity.

Applicants for (b) should possess adminstrative and operation experience on modern h.p. turbines, boilers and electrical equipment, and be capable of organising plant efficiency tests on all equipment. Shift experience an advantage.

Applicants for (c) should possess wide practical experience in mechanical maintenance on modern h.p. turbines, boilers and auxiliary equipment of large capacity. Knowledge of electrical maintenance an advantage.

Applicants should possess not less than ten years' first-class practical experience and technical training. University Degree, Higher National or Membership of Mechanical or Electrical Association an advantage.

Appointments are superannuable and the Commission is prepared to meet reasonable transport costs for successful applicant and family from Britain to Canada.

Applications, stating age, experience and qualifications should be addressed to: Mr. H. Hobson, 19 Montagu Square, London, W.1, and should be received not later than ten days following issue of advertisement. (L 666)

SOUTH WESTERN ELECTRICITY BOARD

VACANCY for ASSISTANT (Installation and Contracting) ENGINEER, Exeter District. Commencing salary within Class "E.12" (£420-£436 p.a.) of the N.J.B. Agreement.

Applicants should have had a sound general and technical education and be capable of preparing and supervising schemes for all classes of electrical installation work, including specifications, estimates and tenders.

Applications, stating age, present position and salary, qualifications and experience, should reach the District Manager, 46 North Street, Exeter, within ten days. (L 665)

ARMATURE WINDING FOREMAN for small winding shop. 12 hands. Good conditions for right type of man.—Dow and Nicholson Ltd., 10 Wellington Place, Aberdeen. (L 618)

CHIEF DESIGNER, to take full responsibility for designs of all types of transformers up to 10,000 kVA at 66 kV, required by modern factory in North London area.—Applicants must give full details of experience, qualifications, age, and remuneration expected. Box No. 9051, Electrical Times. (L 581)

CHIEF DRAUGHTSMAN and three Seniors with design experience of heavy duty cooking equipment required by Midland manufacturers. Initial salaries up to £850 and £650 respectively, according to experience. Five-day week; canteen; pensions scheme.—Please write with full details of past experience and degree of responsibility, in strict confidence, to the Secretary, Box No. 9045, Electrical Times. (L 574)

CHIEF ELECTRICIAN REQUIRED. Experience of all types of metal welding machines, some knowledge of electronics and modern electric controls. Ability to supervise maintenance section large works essential. Contributory pension scheme.—Reads, Ltd., Orrel House, Orrell Lane, Walton, Liverpool 9. (L 636)

CONSULTING ENGINEERS require the services of a fully qualified Electrical Engineer for employment as ASSISTANT ENGINEER in their London office. Applicants must have served a recognised apprenticeship at the works of a well-known firm of an electrical manufacturers and should hold corporate membership of the Institution of Electrical Engineers. Duties include inspection at the works of manufacturers and successful applicant will be expected to travel as and when required in connection with these inspections.—Details of age, experience and salary required, Box No. 373, c/o Dawson's, 129 Cannon Street, E.C.4. (L 643)

DRAUGHTSMEN with experience of switchgear and/or rectifier design required by Hackbridge and Hewittic Electric Co., Ltd., Walton-on-Thames. Pension scheme, five-day week.—Write, giving past experience, technical education and salary required, to Chief Mechanical Engineer. (L 549)

DRAUGHTSMEN, with experience on all sizes of power transformers, required by company in S.W. London. Pension scheme in operation and five-day week.—State full details, past experience, technical education and salary required.—Box No. 9039, Electrical Times. (L 547)

ELECTRICAL.—Wanted by Singapore and Malayan company of engineers, single man, aged 23 to 32 years, with Grad. I.E.E. or Higher National Certificate of Electrical Engineering, preferably with experience of Diesel-operated generating stations.—For terms of service, salary, allowances and provident fund, etc., apply Box No. 9061, Electrical Times. (L 569)

ELECTRICAL AND MECHANICAL ENGINEERS AND METALLURGISTS are required for experimental work at the Research Laboratories of the General Electric Co., Ltd., East Lane, North Wembley, Middlesex. Graduate staff are needed for work on radio-communications, domestic heating appliances, illumination, light mechanical engineering problems and in the metallurgical field.—Applications, giving age and record, should be sent to the Staff Manager (Ref. GBLC/735). (L 564)

ELECTRICAL DRAUGHTSMAN required as Section Leader. Capable of planning power and lighting installation for workshops. Good technical training and experience essential and knowledge of estimating an advantage. Salary commensurate with ability. This is a progressive position. Staff pension scheme in operation. —Write, stating age, experience and qualifications, to Labour Manager, Rubery Owen and Co. Ltd., Darlaston. (L 614)

ELECTRICAL ENGINEER required, age 35 to 40. Must have high technical qualifications and be a Full Member of the Institution of Electrical Engineers. Applicants should have had at least ten years' experience in manufacturing and on the test bed, of motors, starters and switchgear.—Apply in the first instance to the Chief Engineer, The Bowater Paper Corporation Ltd., Northfleet, Kent, stating age and salary required. (L 529)

ELECTRICAL LABORATORY ASSISTANT required for development work on interesting project. Excellent opportunity in rapidly expanding company. O.N.C. an advantage but not essential.—Details, experience and salary to Mr. G. T. Atkins, Chief Electrical Engineer, British Messier Ltd., Gloucester. (L 576)

ELECTRICIAN wanted, experienced, by Electrical Contractors in Central London area.—Box No. 9069, Electrical Times. (L 642)

EXPERIENCED ENGINEERS accustomed to the erection of lattice tower, concrete and wood pole overhead transmission lines and willing to serve either at home or overseas, age 25/45. Good prospects and pension.—Apply, in writing, giving full details to Staff Officer, British Insulated Callender's Construction Co. Ltd., 21 Bloomsbury Street, London W.C.1. (L 621)

FIRST-CLASS PLANNING AND METHODS ENGINEER required to apply most modern assembly methods to manufacture of small electro-mechanical products, West London area.—Write, giving age, full details of experience and salary required, to Box No. 9053, Electrical Times. (L 582)

HANDLEY PAGE LTD. require an ELECTRICAL TECHNICIAN, preferably with H.N.C. (Elect.) and with a knowledge of electronics, for work in connection with the development of aircraft electrical circuits and installations.—Write, stating age, qualifications and details of experience, to Staff Officer, Handley Page Ltd., Cricklewood, London N.W.2. (L 566)

MALES required as testers on electrical measuring instruments. Experience desired but not essential. Good opportunities for young men with National Certificate or equivalent.—Write for interview, stating age and previous experience, Sangamo Weston Ltd., Cambridge Road, Enfield, Middlesex. (L 553)

MANAGER for Sales and Order Dept. of electric cable factory, S.W. London area; knowledge HOME AND EXPORT TRADE.—Reply, in confidence, stating age, experience and salary required, to Box No. 9043, Electrical Times. (L 563)

OVERSEAS EMPLOYMENT. ELECTRICIAN required by Mufulira Copper Mines Ltd., Northern Rhodesia. Full apprenticeship essential. General electrical experience, but especially erection and jointing of heavy electrical machinery and switchgear up to 11,000 V necessary. Rate 4/6s. 6d. per 8-hour shift plus bonus (at present 52½ of basic rate). Cost of living allowance at present about £6 10s. per month. Pension and life assurance scheme.—Write Rhodesian Employment Department, Selection Trust Building, Mason's Avenue, London E.C.2, for application form. (L 620)

REPRESENTATIVE for Scotland required with Display Room in Glasgow for Table Lamps, Fittings and Lampshades. Commission basis and good existing connection.—Write Knightshades Ltd., Derby Road, London N.18. (L 618)

SENIOR DESIGNER-DEVELOPMENT ENGINEER required by leading manufacturer of domestic and light industrial electro-mechanical control devices in West London. Only men of proved experience and success in most modern practice need apply. First class opportunity for advancement. Fullest particulars of qualifications, career to date and salary required in confidence, to Box No. 9031, Electrical Times. (L 533)

SKILLED ELECTRICIANS AND MATES required by leading electrical firm for urgent contract work in North London and Home Counties area. Good prospects, permanency and advancement to right men.—Replies, with full experience to Box No. 9065, Electrical Times. (L 612)

TRANSFORMER DRAUGHTSMEN required by Hackbridge and Hewittic Electric Co., Ltd., Walton-on-Thames, Surrey, one having experience of transformers up to 2,000 kVA and one having experience up to 100,000 kVA. Pension scheme, five-day week.—Write, giving age, experience and salary required, to Chief Mechanical Engineer. (L 548)

WANTED—SWITCHBOARD ATTENDANT for trading estate power station. Man with electrical knowledge would be given the necessary training if otherwise suitable. Permanent position, pension scheme, N.J.I.C. rates paid. Apply to Chief Engineer, Slough Estates Ltd., Trading Estate, Slough. (L 617)

APPOINTMENTS FILLED

ELECTRICIAN, FOREMAN or JUNIOR SUPERVISOR required for Melbourne, Australia, Box No. 8035, which appeared in the July 12 and 19 issues. The position is now filled and all applicants are thanked.

FOR BRITISH COLUMBIA, Pacific Coast Canadian Pulp and Paper Mill requires experienced MAINTENANCE AND CONSTRUCTION ELECTRICIANS, which appeared in the July 5 and 12 issues. The positions are now filled and all applicants are thanked.

APPOINTMENTS WANTED

ELECTRICAL ENGINEER, B.Sc., A.M.I.Mech.E. A.M.I.E.E. age 35, with experience of sales and service of motors and planning and installation of plant, seeks opening with good prospects.—Write, Box 107, Bennett Williams (Advertising) Ltd., 15a Westgate, Bradford. (L 644)

ENGINEER, 27, public school, 8 years in industry, national certificate, works; prototype development; D.O. and administrative experience. Progressive post required. Production or factory liaison with light mechanical and electrical manufacturers. Minimum salary, £800. Resident London area.—Reply, Box No. 8067, Electrical Times. (L 489)

ELECTRICAL RESEARCH ENGINEER, 24, six years with well-known scientific instrument makers, requires position as technical representative London area.—Box No. 9071, Electrical Times. (L 663)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed. Edgware 8631 (4 lines).—Service Electric Co. Ltd., Stanmore, Middx. (D 324)

ARMATURE SERVICE CO. LTD., Haddington Street, Hove (Tel.: 32996), electrical engineers and winding specialists. Distance no object. (F 739)

CASTINGS, Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham. Victoria 0197. (L 318)

WANTED

A.C./D.C. MOTORS, STARTERS, complete change-over installation, etc.—A.A. Electrical Co. Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 20)

ELECTRICAL MANUFACTURER wishes to purchase one or two second-hand ALTERNATORS, 10,000 kVA or larger, preferably wound for 11,000 V, 50 cycles for use in Test Department and to run as synchronous condensers.—Particulars and price to Box No. 9067, Electrical Times. (L 615)

ISENTHAL VOLTAGE REGULATORS WANTED. Any condition.—Box No. 7069, Electrical Times. (L 205)

SCRAP ACCUMULATOR PLATES and Sediment wanted, any quantities. Also Storage Batteries purchased and dismantled.—Phone or write Elton Levy Co. Ltd., St. Ermin's (West Side), Caxton Street, London S.W.1. Tel.: WHitehall 9621/2/3. (A 3)

STEEL, ALUMINIUM, BRASS sheets, strip, bars, off-cuts. Any quantity, immediate payment.—Grades Sheared Metal Co. Ltd., Green Lane, Hounslow, Middx. Tel.: Feltham 3274. (L 619)

WANTED, SCRAP ELECTRIC MOTORS, DYNAMOS AND CABLE. Top prices paid.—H. Reed, 36 Bridge Street, Leatherhead, Surrey. (K 11)

WANTED, ROTARY CONVERTORS, any size.—Universal, 221 City Road, London E.C.1. (A 16)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady Street, Bethnal Green, E.1. (A 1)

WANTED, Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling.—Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath. (A 5)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co. Ltd., 22-26 Britannia Walk, London N.1 (A 13)

FOR SALE

CABLES & WIRE

ALL types T.R.S. and V.I.R. CABLE from Stock, at keenest prices in the trade. Send for List.—Northern Industries, Snow Hill, Manchester, 4. (D 50)

TINNED STEEL ARMATURE BINDING WIRE. All sizes from 14 s.w.g. to 30 s.w.g. supplied in coil or on reels.—Frederick Smith and Co., Wire Manufacturers Ltd., Caledonia Works, Halifax. (G 381)

V.I.R. AND P.I.L.C. CABLES, most sizes from 3/029 to 19/083 from stock.—Boyce, Weir and Co., 778 New Hey Road, Huddersfield. Tel. Stainland 2120. (L 611)

DOMESTIC APPLIANCES

IMMERSION HEATERS, Grubb 4 kW. No purchase tax. All lengths, 15 in. to 36 in. Standard voltages. Provision for intermediate loadings. Fully guaranteed. Write for illustrated brochure, latest lists and trade terms to distributors.—John Owner and Co. Ltd., Springfield Road, Birmingham 13. Tel.: Spr. 2939. (C 392)

GENERATING PLANT

ALBION TWW WORKS

PETROL AND DIESEL ENGINES

DIESEL. 104 h.p. HORIZONTAL COLD STARTING SINGLE-CYLINDER CRUDE OIL ENGINE by Crossley, speed 210 r.p.m., flywheel 9 ft. dia. by 18 in. face, pulley 5 ft 6 in. by 14 in. face, starting compressor, air bottle, etc.

88 h.p. RUSTON VERTICAL five-cylinder, speed 1,000 r.p.m., flywheel 26 in. dia. by 4 in. face. Reavell vertical two-stage starting compressor.

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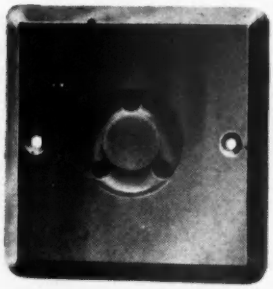

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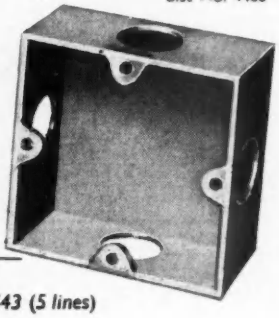

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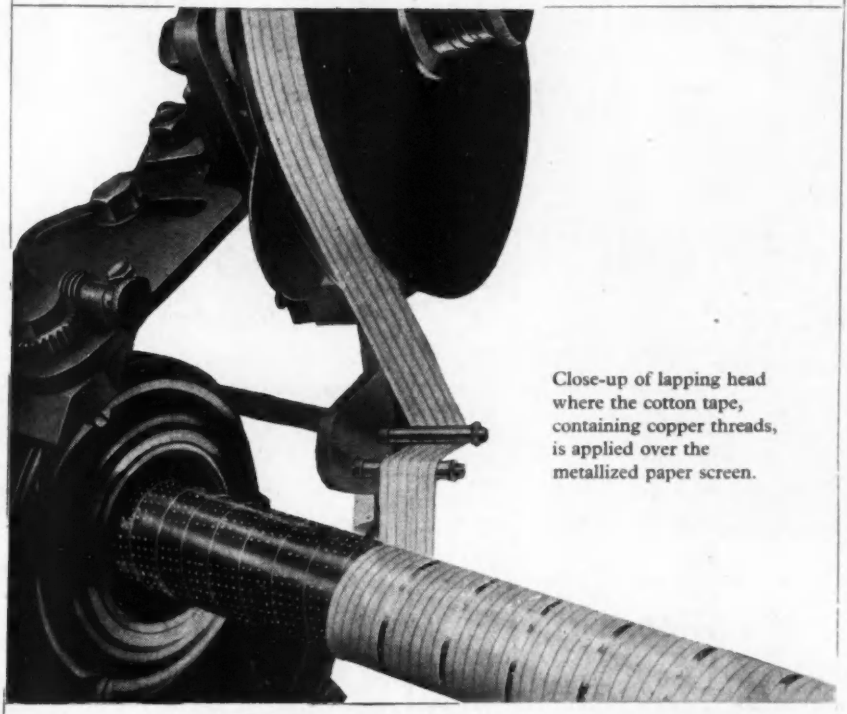

Close-up of lapping head where the cotton tape, containing copper threads, is applied over the metallized paper screen.

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90	750	Brook	S. Prot.	S. Ring
90	1,000	Brook	S. Prot.	S. Ring
90	970	L.D.M.	Enc. Vent.	S. Ring
75	740	Crom-Park.	T.E.F.C.	S. Ring
70	1,000	Brook	S. Prot.	S. Ring
70	1,500	Brook	S. Prot.	S. Cage
67½	1,500	E.C.C.	Enc. Vent.	S. Ring
65	1,500	Brook	S. Prot.	S. Ring
60	750	Brook	S. Prot.	S. Ring
60	1,500	Brook	S. Prot.	S. Ring
55	1,440	Brush	S. Prot.	S. Ring
55	1,500	Brook	S. Prot.	S. Ring
53	1,500	Brook	S. Prot.	S. Cage
50	750	Brook	S. Prot.	S. Ring
50	1,000	Brook	S. Prot.	S. Ring
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50	465	Brush	S. Prot.	S. Cage
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25	1,000	Brook	S. Prot.	S. Ring
25	1,000	L.S.E.	S. Prot.	S. Ring
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25	750	Brook	S. Prot.	S. Cage
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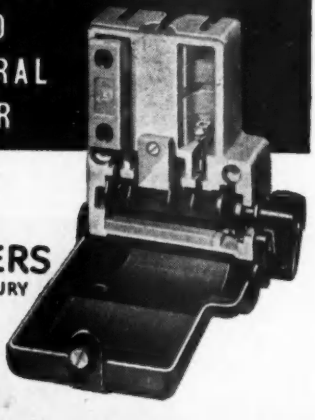

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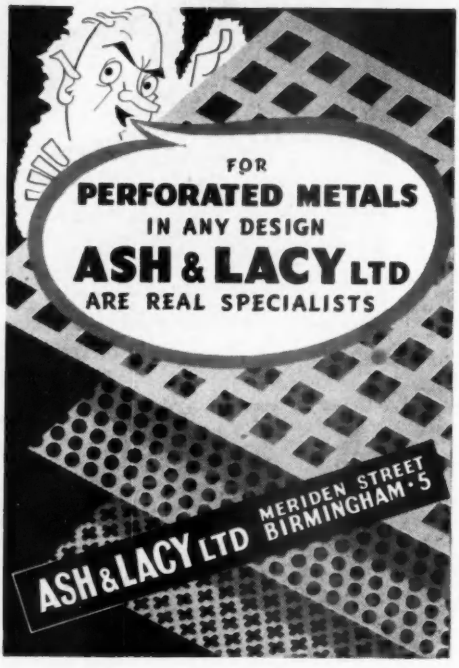

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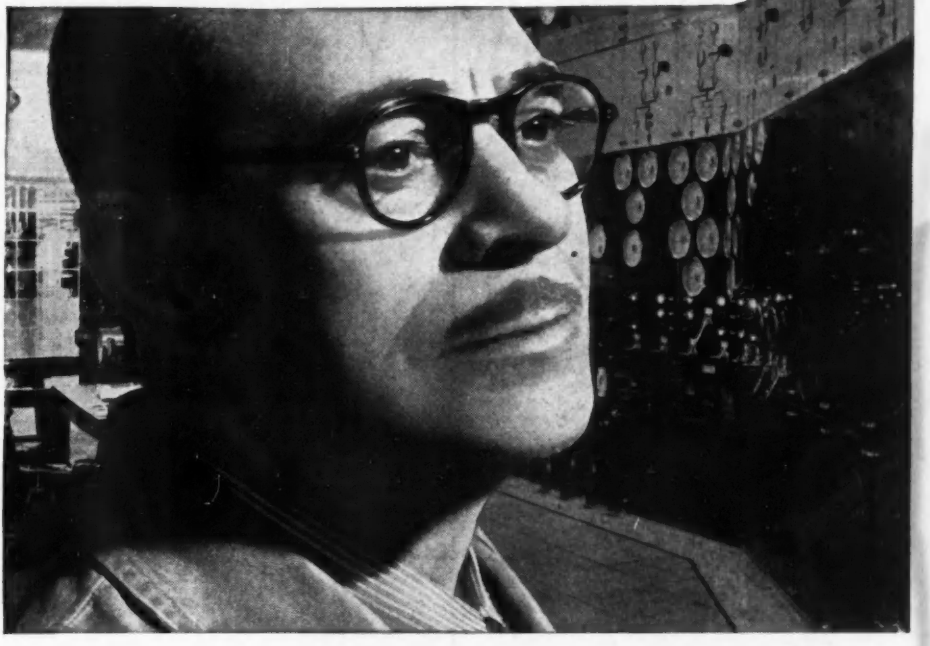

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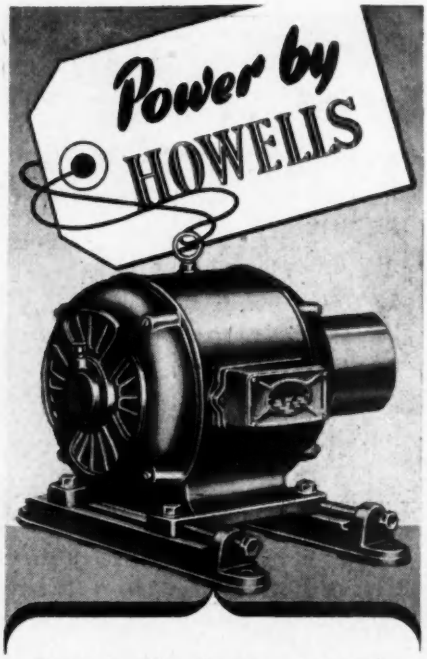

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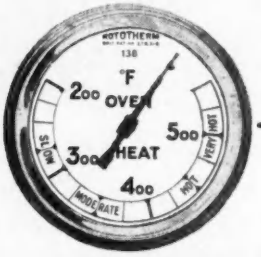

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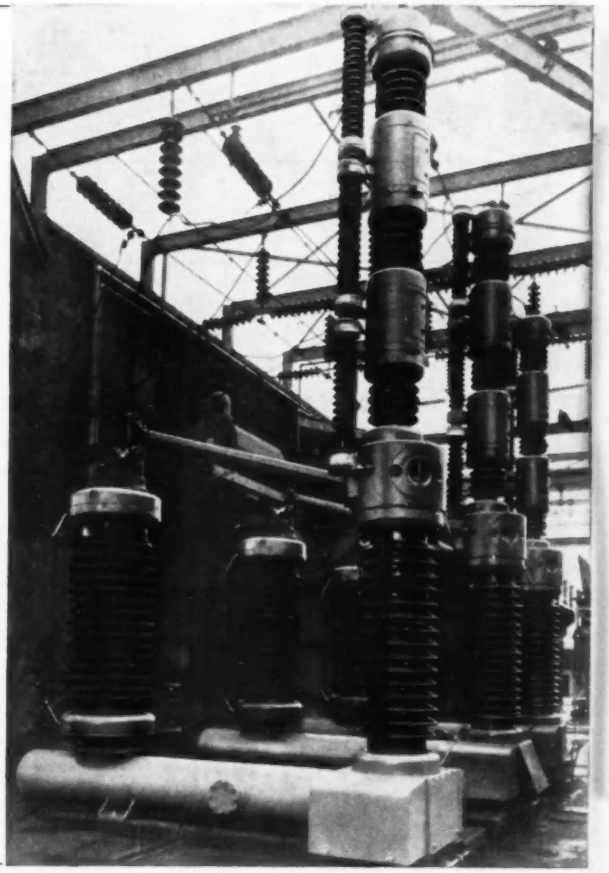

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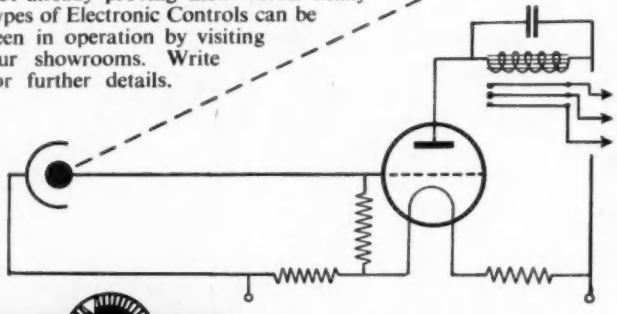

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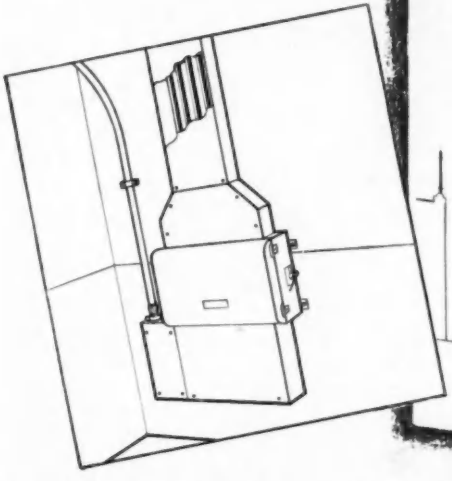

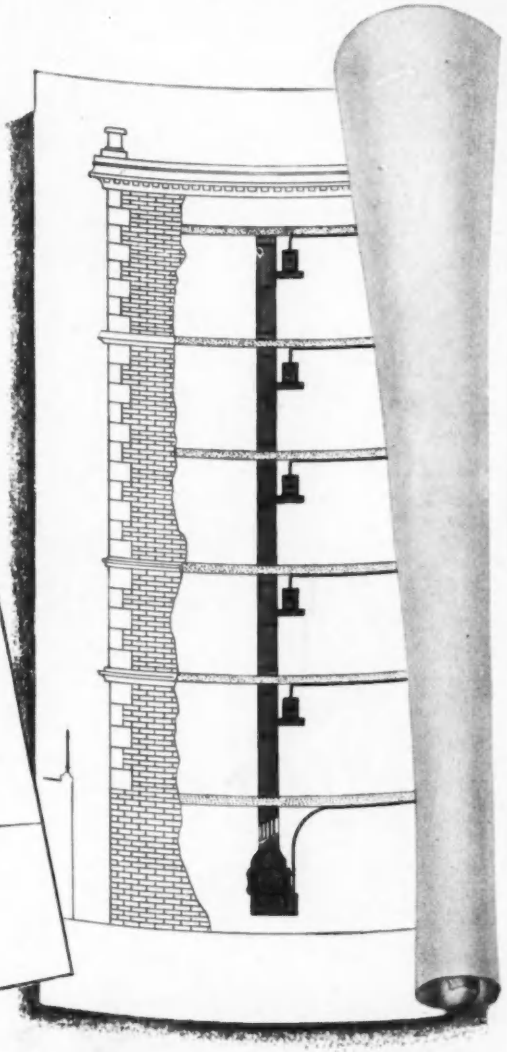

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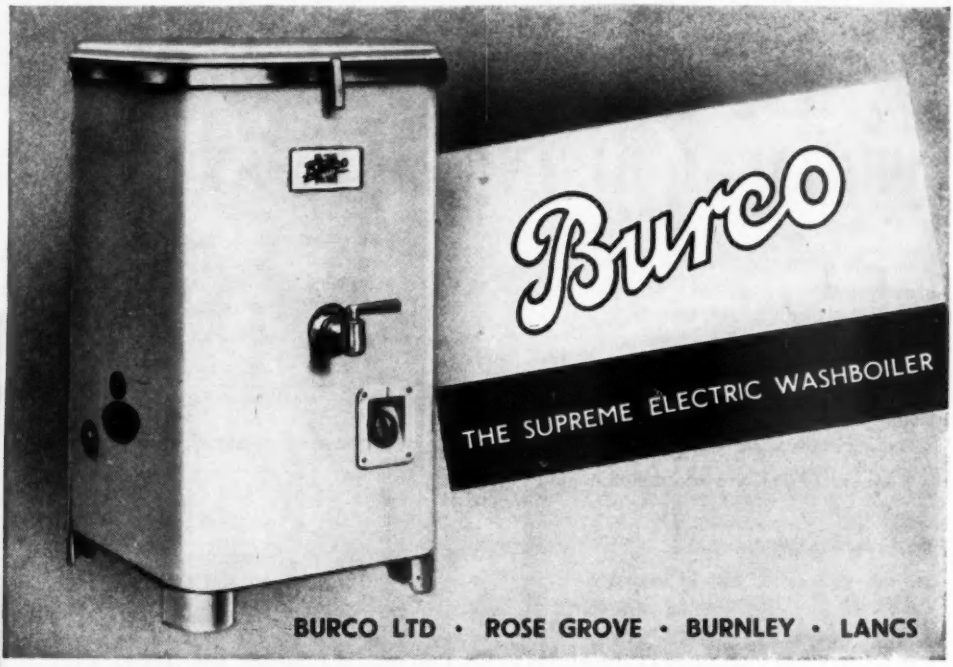

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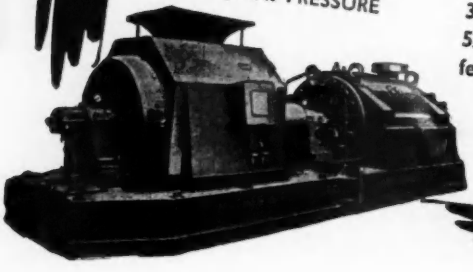

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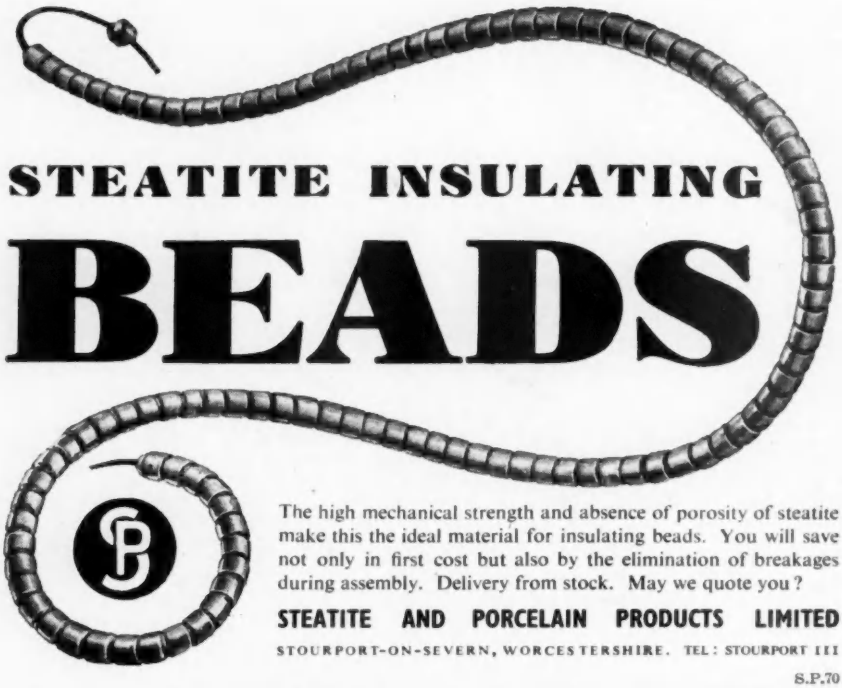

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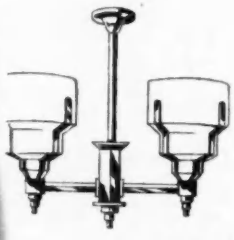

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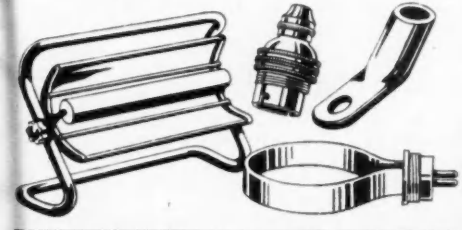

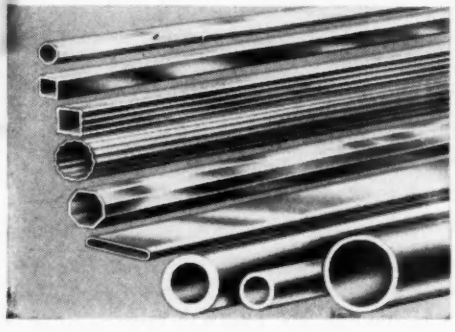

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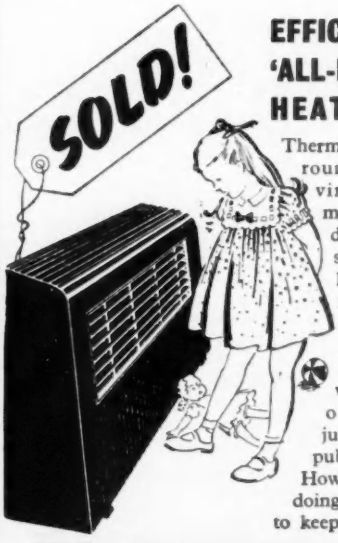

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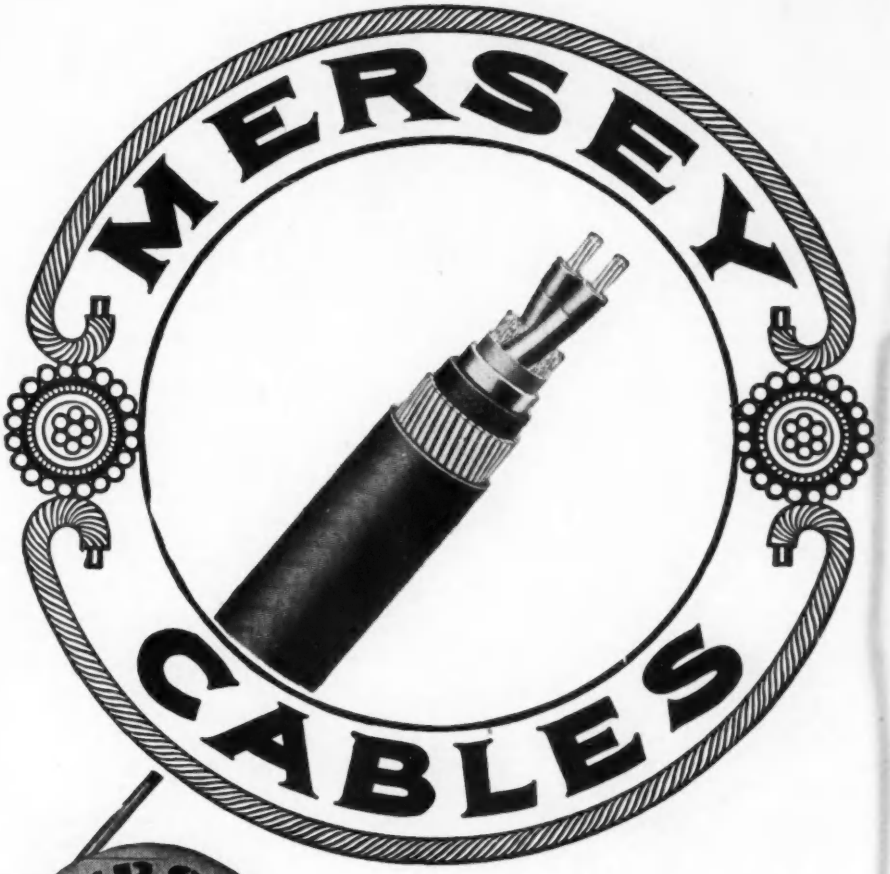

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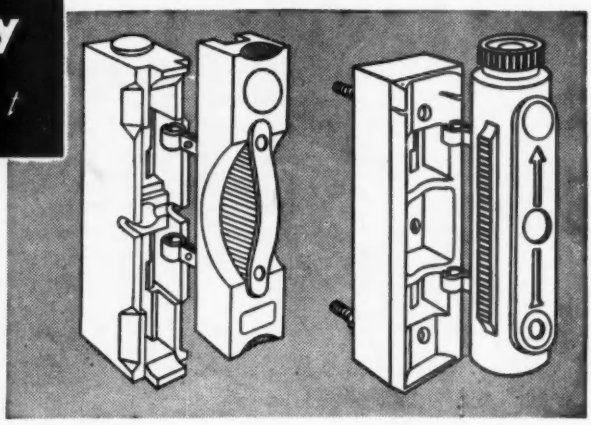

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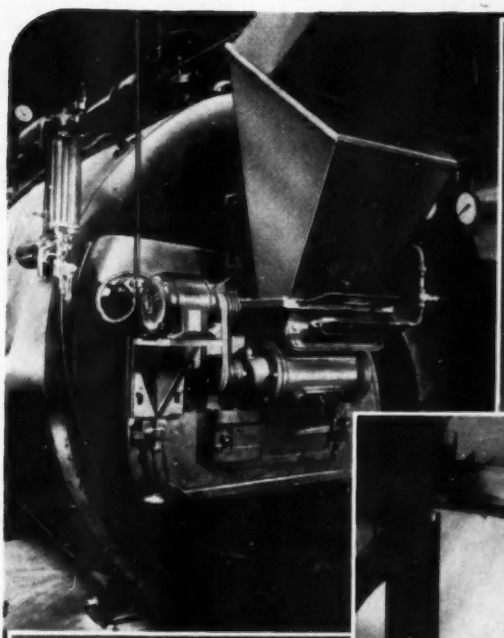

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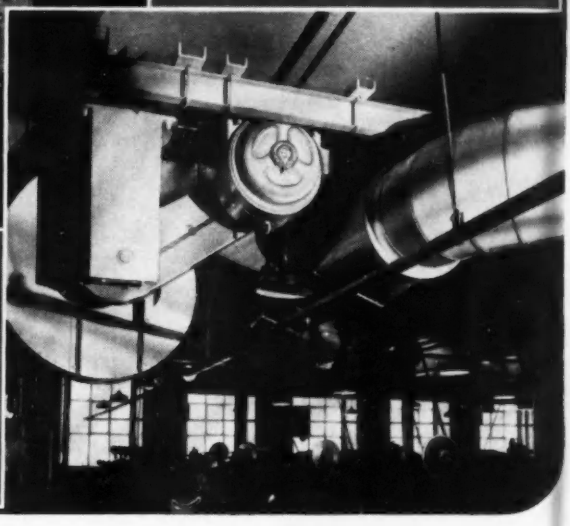

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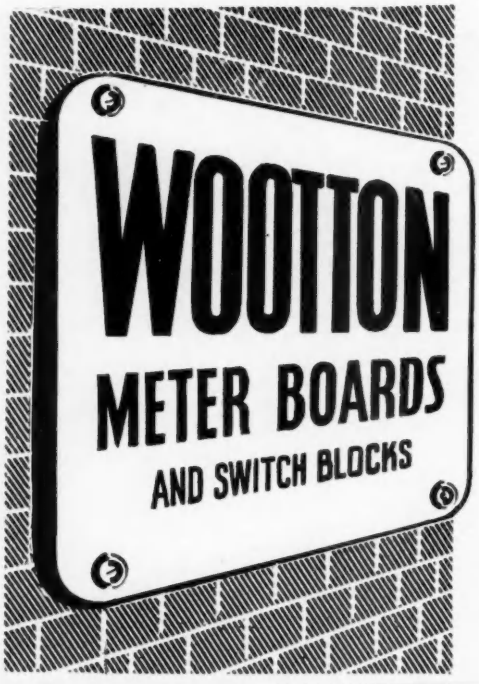

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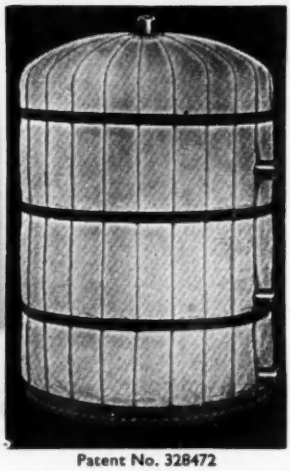

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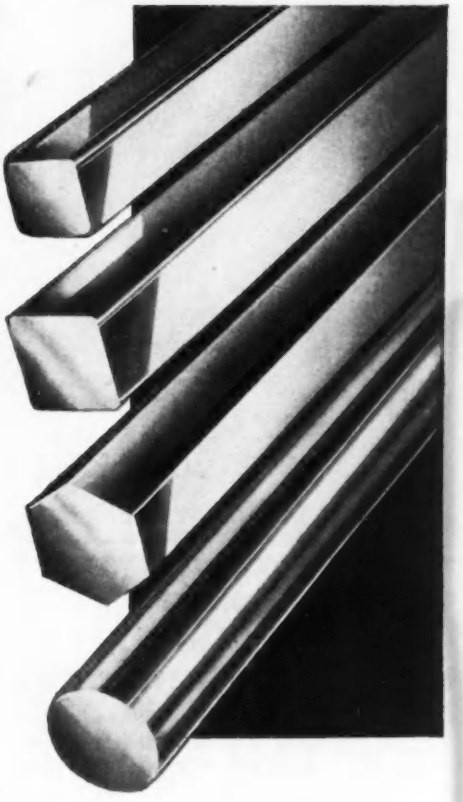

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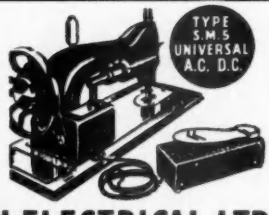

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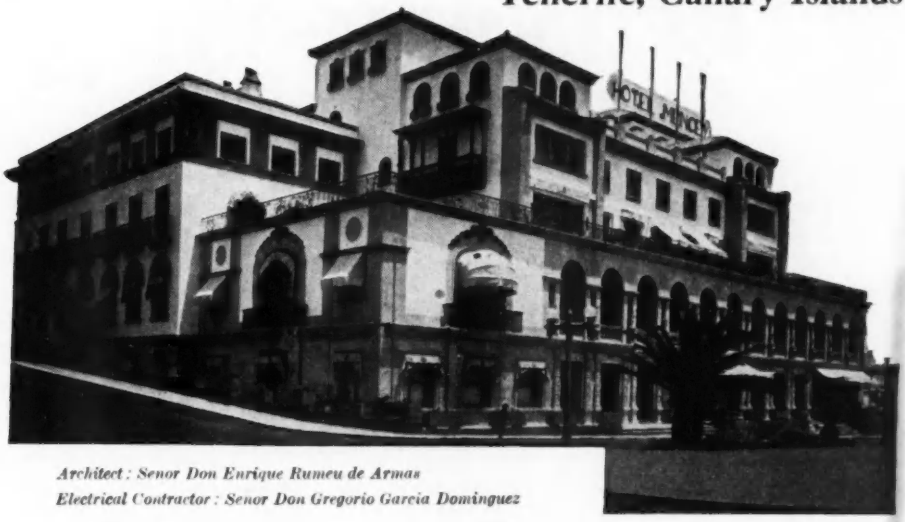

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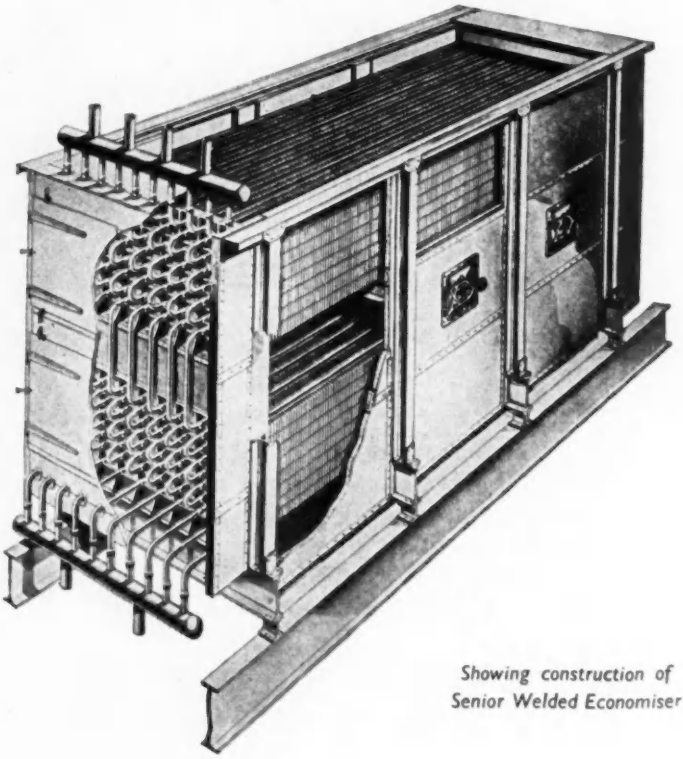

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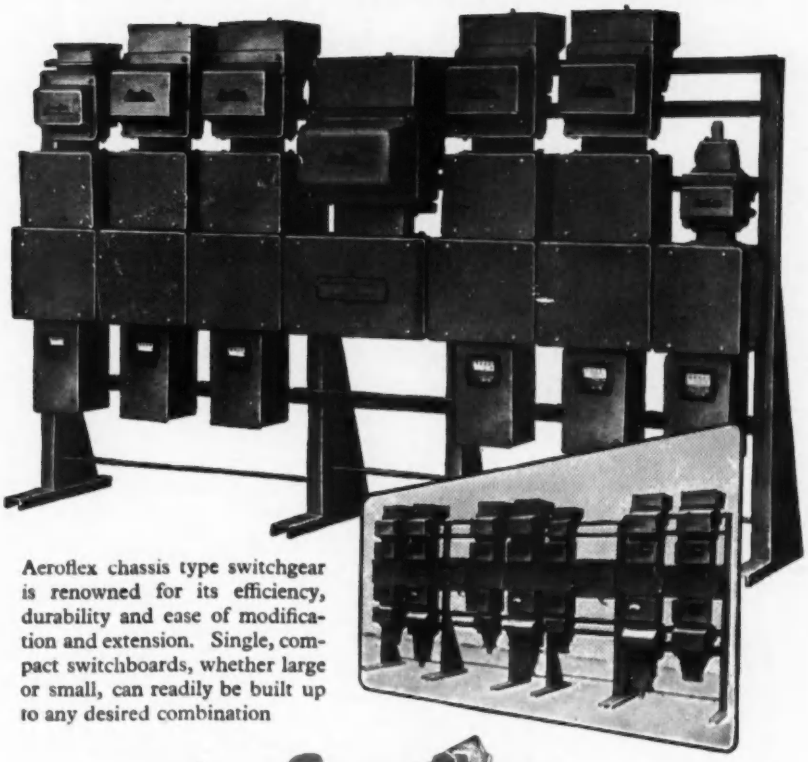

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